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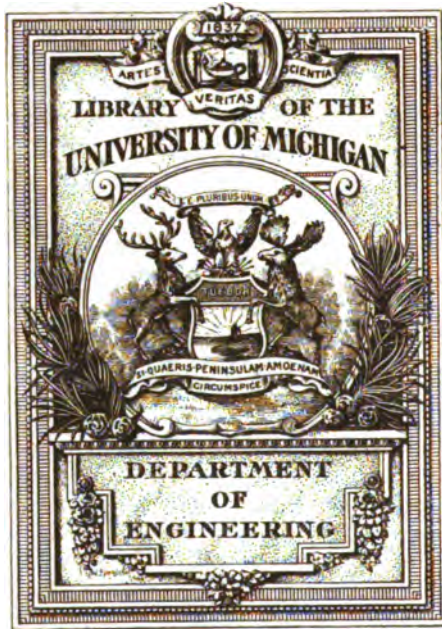
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THE PRINCIPLES OF
LAND DEFENCE

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LAND DEFENCE

THE PRINCIPLES OF LAND DEFENCE

AND THEIR APPLICATION TO
THE CONDITIONS OF TO-DAY

BY
very interesting
CAPTAIN H. F. THUILLIER
ROYAL ENGINEERS

WITH ILLUSTRATIONS

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P R E F A C E

THE reason for the employment in the title of this book of the term Land Defence rather than Land Fortification is that the latter term has come to be generally regarded as having reference only to the design and construction of defensive works, whereas the preparation for and conduct of the defence of a land fortress involves many important questions besides this one. Tactics and organisation fill so large a part that no consideration of the question would be complete that did not deal with them. It is with Tactics in particular that Fortification is indissolubly connected, so much so that it would hardly be too much to say that Fortification is itself but a special branch of Tactics and not a separate division of the Military Art.

Though the purely technical parts of the subject are relegated to special branches of our forces, yet a knowledge of the correct tactical disposition and employment of defensive works is a necessity for every soldier. It is the general custom in English military teaching to make a broad distinction between Field Fortification and Permanent Fortification, and to consider the former as a subject to be understood by all branches, and the latter to be an abstruse science confined to the technical branches. This is wrong; the two are the same in principle, and, though works of the one nature have to be executed by the troops themselves while those of the other are constructed under the superintendence of technical experts, yet the design and disposition of either lie entirely within the domain of the practical soldier, and a knowledge of the principles is as important a part of military education as any other branch of the warlike art.

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There will be found in the following pages no technical constructive details whatever; of such our technical text-books are the proper place. Nor will it be sought to lay down precise rules and rigid types, which, even if correct for the day, would shortly become obsolete. What is aimed at is indicated in the title, namely, an exposition of the broad principles which underlie the art of Land Defence, based as far as possible on an analysis of the principal defensive operations of past times, and a deduction from these of the defensive methods and organisation which are likely to be best suited to the tactical conditions of the present day.

It may perhaps be thought that operations which took place long ago under widely different tactical conditions will not throw much light on the methods most suited for to-day, and that it would suffice to illustrate the principles from the events of quite recent campaigns. This practice, however, of basing our tactical conclusions entirely on the events of one recent campaign is an incorrect one, and to it is due a very large proportion of the mistaken theories which from time to time arise in matters military. Broad principles do not vary at all with the passage of time; it is the method of applying them which alone changes with the tactical conditions.

It will invariably be found that the methods of the great commanders of past times clearly illustrate the fundamental principles of all branches of the military art; and the events of the present day will confirm these and show how the method of applying them is affected by the changing tactical conditions. It is therefore from a consideration of both of these, and not of the latter only, that we will find a key to the problems of the future.

May 1902.

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THE PRINCIPLES OF LAND DEFENCE

CHAPTER I

INTRODUCTORY—FORTIFICATION IN RELATION TO STRATEGY—THE
PLACE OF FORTIFICATION IN NATIONAL DEFENCE—THE NECES-
SITY FOR FORTIFICATION

ALL recorded military history shows that the broad principles which underlie the art of Fortification have been the same in all ages and in all climes. The method of applying those principles is determined by many considerations, above all by the weapons employed on either side. But none of these things affect the principles, which are the same to-day as in the time of Hannibal. What these principles are, how their working may be traced in the history of past warfare, and how they can best be fulfilled under the tactical conditions of to-day, are the points with which it is proposed to deal in the following pages.

In order to arrive at a clear conception of these principles, it is necessary to enter in some detail into a consideration of the ends and aims of fortification generally. Fortification must be considered as an indispensable adjunct of the great operation of war which we know by the name of Strategy. The immediate object of War is

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the destruction of the enemy's forces and powers of resistance, with a view to enforcing upon his government and people the terms of the conquerors. Strategy consists, as we know, in the organisation and disposition of military forces with a view to the most speedy attainment of this end.

The main broad principle which underlies all strategy is the concentration of overwhelming force upon the points where the most decisive results will be obtained. It is evident that, to enable the utmost available force to be concentrated at the opponent's most vital spots, other points in the theatre of war must be comparatively lightly held. In enabling this to be done Fortification plays an important part. Again, one may assume with reasonable certainty that the opponent will similarly apply the rules of strategy in his operations against oneself, and that therefore localities vital to one's own welfare must be adequately protected. In order, therefore, not to be obliged to lock up large forces in the defence of vital points, and thus to reduce the force available for aggressive action against the enemy, these points should be protected by fortification. Fortification, therefore, is one of the means by which strategical results are obtained.

Though in the definition given above of strategy the term "military forces" has been made use of, yet it is not intended that this term should comprehend only land forces. In the case of an essentially maritime Empire like ours the strategic conduct of a war would necessarily embrace the whole of the national forces on land and sea, and the theatre of war, if opposed to another maritime Power, would be the whole world, but the principles set forth above would be equally applicable. The decisive blow to be struck at the enemy

might consist in the concentration of our naval forces against his, or in the transport by means of the navy of an army for the invasion of hostile territory, or, as is still more probable, in the one followed by the other; but whatever the form it may take, the protection by fortification of the many strategic pivots in our chain of world-wide possessions by land and sea is a necessity, in order to free for offensive action as much as possible of our force, and to defend those important points from surprise or attack by relatively small hostile bodies.

On the other hand, though Fortification is one of the means by which strategical results are obtained, it can never under any circumstances, even in a war entered on purely in defence of our own possessions, be the only one. In this case, as in every other, ultimate success can only be obtained by the destruction of the enemy's forces, or by the seizure of some point of vital importance to him, and for this end aggressive action is absolutely necessary.

It may seem superfluous to dwell on these elementary principles in regard to the objects of fortification, but there is ample evidence to show that the proper position of Fortification in relation to National Defence has not always in the past been fully grasped even by those on whom devolved the responsibility of the organisation of the country's forces, and much less by the public in general. There was undoubtedly a time when the prevailing opinion was that, because the nation indulged in no aggressive designs against the possessions of other Powers, and was only desirous of protecting its own possessions from possible attack, all that was necessary was the fortification of those possessions, and that the active forces on land and sea could be reduced to the minimum compatible with such passive defence.

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The fallacy of such a mode of reasoning must, it may be thought, have been discerned even in those days by such as took the trouble to study the question by the light of past history. At any rate it has fortunately been seen of recent years, both by the Government and the majority of the thinking public, though it seems that there is still a section of the latter to whom it has not come home.

There is, however, a danger of falling into the other extreme. The recognition of the fact that ultimate success in war can only be obtained by active methods, coupled with hasty deductions made from the enormous increase which recent years have brought about in the power of weapons—a question the bearing of which on Fortification will be fully discussed later—has led in some quarters to a disparagement of the science of Fortification on the grounds that it is generally unnecessary and has now become ineffective. The last-named idea has been dispelled by the events of the war in South Africa, which has shown that the power of even the roughest defence works is far from having been decreased by the improvements in ordnance; neither have the events of that war borne out the view that fortification is less necessary now than formerly; on the contrary, they have clearly confirmed in several instances the teaching afforded by all past military history that the aid of this science is often essential to secure certain strategical results.

The fact that in the British Empire the majority of the strategic points which require to be fortified are ports or naval bases makes the question of Land Fortification of less importance to us than that of Coast Fortification. Coast defences have to be designed to meet a totally different form of attack than land de-

fences and to resist the more powerful weapons carried on ships. The conditions, in fact, are so different throughout that coast fortification may be said to constitute an entirely distinct branch of military science and one requiring special knowledge and study. It is not proposed to deal with it at all in the following pages.

It has been said that, since the land frontiers of the British Empire are little liable to an attack which would not be preceded by long warning, Land Fortification possesses for us but a secondary interest. It is true that its importance to us is less than in the case of countries on the European continent, where a fortnight after the first outbreak of war may witness the irruption of nearly half a million of armed men on to the national territory. In such a case the fortification of strategic points on or near the frontier is a matter of vital necessity, as the nation's existence may depend on the readiness of the border fortresses, and no expenditure or exertions can be too great to make these as strong, and as completely equipped as possible.

But this does not mean that fortification is unnecessary for us. In extent the land frontiers of the British Empire are greater than those of any other Power except perhaps Russia. First, we have that of Canada. Here, we have a very long line of exposed frontier, where in the event of war occurring with our neighbours on the American continent the fortification of certain strategic points would be a matter of the first necessity.

We will not enter into the question of whether our political relations with the United States are such as to make the construction in peace time of fortification works on that frontier desirable or otherwise. That is a question for the statesman rather than for the soldier. From the point of view of the latter, the military situation

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is as follows. We have a neighbour who is in that locality far superior in strength and resources to ourselves, a neighbour with whom we have been at war in the distant past, and within measurable distance of war only a few years ago. An extremely long line of undefended frontier with few natural defensive features, and a peculiar element of weakness in the fact that the trunk line of railway from east to west is liable to be cut at any point. From a military point of view therefore our position there is very bad.

On the north-west frontier of India the military conditions are different, but the political situation is more defined. It is true that the actual border is separated from that of our great Asiatic rival by a small friendly State, but the obstacle interposed by this is more of a diplomatic than of a material nature, and it is certain that in the event of a war with Russia an attack would be made in this quarter, which is not only the most vulnerable point in our dominions, but also one where the defeat of our forces would bring about the most striking and decisive results. Defences, properly organised and equipped in peace time, are therefore necessary at certain points there, and have, in fact, already been provided; on the outbreak of war more also would be required.

The Empire has other land frontiers, short or long, in every continent. Up till recently portions of her territories were contiguous with those of the small but hostile South African Republics. The fact that war in that quarter had been clearly foreseen for years past makes the omission to fortify and arm the strategic points on our side of the border the more remarkable. The omission had the most calamitous and far-reaching effects upon the opening parts of the campaign, and in the light of

actual events one can only say that the wonder is that the effects were not worse. Without, however, attempting to picture what might have happened had the Boers shown more strategical enterprise at that period, it is evident that, had certain strategic points on the borders of Natal and Cape Colony been fortified, armed and supplied before the war, many of the great difficulties which beset the British commanders at the beginning of the campaign would never have arisen. The omission to fortify in advance was probably from political reasons, criticism of which is beyond the province of a military writer, but judged from a purely military point of view it is difficult to defend.

There are other places, plenty of them, in Africa and elsewhere, where our colonial territories march with those of other Powers. It may not be possible at present to see the germs of conflict in most of these localities, but it would be rash to prophesy that such contingencies will not arise in the future. In such an eventuality it would almost certainly be necessary to fortify certain points, in order by defensive action to gain time to permit of the Imperial resources being organised and brought to the scene of operations.

But even the localities mentioned above are not the only ones in the Empire where land fortification is, or may become, a necessity. In nearly all coast fortresses also the landward side of the place requires to be protected against attack. The existence at an important port or naval base of powerful coast defences would make an attack on their land fronts by forces disembarked at distant and unprotected points on the coast the easiest method of capturing them. The conditions governing the fortification of these land fronts would be identical with those of purely land fortresses, and the principles

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set forth in the following pages apply equally to such cases, numerous examples of which exist throughout the Empire.

It is not proposed to discuss any further the strategic necessity for fortification, or to give any examples of it, though past history affords an immense number. It will be conceded that even for us fortification is often a vital necessity, and enough has been said to show that the subject is worth the utmost attention and study from soldiers. It will be shown later on that the actual design and construction of the works is only a small part of the art of Land Defence, and that many questions of tactical organisation are of far greater importance. Except therefore as regards the purely technical details, the subject is not one that should be left solely to the technical and expert branches, such as the engineers and fortress artillery. It vitally concerns all soldiers, and its principles require to be laid to heart by all who aspire to a knowledge of the military profession.

CHAPTER II

THE TACTICAL ASPECT OF FORTIFICATION—FORTIFICATION A MEANS,
NOT AN END—THE OBJECT OF FORTIFICATION TO GAIN TIME

FORTIFICATION is not a self-contained independent branch of military art, but is subservient to both strategy and tactics. The most elaborate and costly works, if devised without regard to these, are not only useless but detrimental. The connection of fortification with strategy has already been indicated in the last chapter and it is not proposed to discuss it further; practically it may be said that strategical considerations alone govern the question as to whether a given locality is to be fortified or not. The tactical aspect of fortification lies in its adaptation to the natural features of the ground and to the nature of the weapons employed by either side; tactical considerations, based principally on the above, but also on the probable direction, nature, strength, and other conditions of the expected attack, will govern the general disposition of the defensive measures, the strength of the garrison and the armament required.

The above statement refers equally to permanent and to field fortifications. In both cases the underlying principles are identical, and similar tactical considerations govern the one as the other. The chief difference is, that in the case of field fortifications, which have to be carried out by the troops themselves, with such tools as they carry with them and such materials as can be found on the spot, in the short time which is available before the

expected attack, the nature of the works constructed is necessarily limited by these conditions; while in the case of permanent defences constructed after full consideration in peace time all the resources of science and wealth can be employed. It is, of course, not intended to assert that at any given locality the disposition selected for defensive works of a permanent nature would be the same as what would be selected at the same place in the case of hasty defences thrown up in immediate anticipation of attack. It is evident, for instance, that defence works thrown up on a battlefield for purely temporary use by part of a field army, which must necessarily keep in view that immediate offensive action which alone can command success, would be different from those erected for protracted passive defence of a locality against a superior investing force. Also in hasty work the want of time and materials would naturally restrict the scope of the defences. What is meant is that, allowing for such differences in the conditions, the tactical principles to be kept in view would be the same in either case.

It is also necessary in every case, both in deliberate and hasty fortification, to keep in mind the fact that the fortifications themselves are only a means to an end. It may seem superfluous to insist on so elementary a point as this, but there is no doubt that there have been times in the history of every European country when this principle has been lost sight of, when technicalities have been allowed to smother tactical principles, and the mere provision of defences been made an end in itself. Nothing else can account for the construction in many places, not excluding the British Empire, of monumental works of the most elaborate design, but utterly disproportionate to the ends to be attained.

Such misconceptions are apparently inherent in the

military art, and are not confined to the fortification branch of it. For instance, drill is a case in point. Here the end is to ensure discipline and concerted action on the field of battle, and the means is constant exercise in the performance of movements in suitable battle formations. But drill has sometimes come to be regarded as the end instead of as the means, and battalions have been judged by their proficiency at ceremonial exercises instead of by their practical training for war. The cause of these perversions is that in peace time military training and organisation have necessarily to be carried on by the light of theory alone. In all civil business or science daily practice can be made available to test the truth of theories. Not so in military science. After twenty years' peace the lessons of the last war become out of date; weapons and tactical conditions change; it is impossible to forecast accurately the effect of the new weapons; the workings of theory are therefore largely in the dark, and cannot be tested till war supervenes. Under these circumstances it is hardly surprising that theory often goes wrong. The only method by which success is likely to be obtained in devising methods of fortification (or rather by which serious error is likely to be avoided) is to keep steadily in view the ends to be attained, to note from a study of history how these ends were achieved under the varying conditions of the past, and to endeavour to adapt the same principles to the conditions of the present. The recent war in South Africa has thrown a bright light on the tactical effects of the new weapons, both in the attack and the defence. With this experience fresh in our minds it seems a good opportunity to put the above methods into practice, and to formulate some ideas as to the defensive systems which will, it is thought, best answer modern requirements.

It will be convenient to ask before proceeding any further, What are the ends aimed at in fortifying a locality? The locality may be a point on the frontier of a state by which an invading enemy must pass, such as an important bridge over an impassable river, or the pass by which a road or railway traverses a mountain range; it may be an important railway junction by means of which troops can concentrate, or an advanced base containing great supplies of stores and munitions of war, an arsenal or manufacturing depot for warlike stores, or a town of great political importance, such as the capital of a country or province; it may even be a place without any geographical or political importance, but of strategic value in guarding the flank of a line of advance or of communications, or as a means of drawing off or holding forces of the enemy while strategic movements are being carried on elsewhere. In each and every case the object aimed at is to prevent for as long a time as possible the enemy from obtaining possession of the place guarded. It is also necessary that it should be possible to do this by means of a force relatively considerably weaker than that of the assailants. It is for the achievement of the latter condition that defensive works are constructed, while for the purpose of prolonging the defence great stores of food and munitions of war are collected in advance.

Before entering on a discussion as to the details of the various methods of defence, it is as well to state that no fortress can by its own unaided efforts keep off an investing army for an indefinite time. However strong the works and powerful the armament, however complete the organisation and ample the supplies, a fortress will never, if invested by superior and resolute forces, be able to achieve its own deliverance without external help. This external help may take the form of an army

advancing to its relief by driving off the besiegers, or it may be the effect of successful strategical action in other parts of the theatre of war, which results in the withdrawal of the assailing force; but failing these it is absolutely necessary that the external communications of the fortress should be kept open so that fresh supplies and munitions can be received. Without this it is a mere question of time till the garrison are forced to lay down their arms from starvation or lack of cartridges. On the other hand, with open communications there is no reason why a properly defended fortress should not be able to hold out for an indefinite time even against a greatly superior force.

It may possibly be asserted that instances can be found in history which refute the above argument, and that cases have occurred of fortresses effecting their own deliverance without external aid. It is believed, however, that a closer examination will show in every such case that the raising of the siege, or the protracted defence, is attributable either to exterior strategical causes or to the fact that open communications enabled supplies to be kept up.

The siege of Gibraltar is probably the longest and most successful defence on record. The fortress, which was invested both by land and sea, held out from the 21st June 1779 till the 2nd February 1783, when the conclusion of the war brought the siege to an end. But it received external aid more than once during that time. The aid was given in this instance by the British navy. In January 1780, after seven months' investment, a fleet under Admiral Rodney broke through the blockading squadrons and brought a convoy of merchantmen laden with supplies of all kinds. Again, in April 1781 the place was relieved for the second time by some men-of-war

under Admiral Darby with a large convoy of provision ships. But for these timely reliefs the place, with its large civil population, could not have escaped the necessity of surrender.

The lines of Torres Vedras might perhaps be quoted as an instance of the self-sustaining power of a defensive position. It is true that Marshal Massena, after having observed the position for five months, retired from before it, not from any external strategic pressure, but from despair of effecting a successful attack, and that his retirement was followed up and harassed by the defenders. But this result was not attained without external aid. The aid, in this case as at Gibraltar, was given by the navy. The defence of the peninsula was only rendered possible by the command of the sea, which permitted of ample supplies and reinforcements being brought up, and which prevented the enemy from turning the flanks of the lines. The position cannot be said to have ever been invested or blockaded.

The siege of Badajos by the British was twice raised. The first time, on the 15th May 1811, the cause was the advance of Marshal Soult's army to its relief. The place was again invested on the 25th May, but after the failure of two attempts to storm Fort San Christoval, the siege was raised on the 10th June. On this occasion the reasons were more complex. The insufficiency of the means for carrying on the siege was undoubtedly one of them; but Wellington's despatches make it clear that it was the knowledge that the armies of Massena and Soult were about to combine for its relief that finally led to his decision. Had time been available he could have reduced it. At the third siege of Badajos in 1812 the place was taken by assault after thirty days' siege.

In the Franco-German war the fortress of Bitsch held

out from the 8th August 1870 to the end of March 1871, when it was evacuated on account of the conclusion of the war. But no regular siege operations were undertaken against it, as they "would have required a greater expenditure in materials, troops, and stores than the value of the fortress would have justified."¹ It was therefore merely observed till the end of the war by a force of four Landwehr battalions and a light field battery, in order to prevent attacks by the garrison on the German provision and ammunition trains. It is evident that no argument as to the impregnability of fortified places can be based on the successful defence of a place which was of so little importance as not to be worth a serious effort for its capture.

Many other instances could be given, and it is therefore believed that a study of the records of past warfare will show that fortified places, if it is possible to invest them by superior force, and prevent the access of supplies, cannot hope to hold out more than a certain time without external aid. What that time may be will depend on many things, such as the *moral* of the garrison, the nature and organisation of the defences, amount of supplies and ammunition, &c., but surrender is sooner or later inevitable unless relief be forthcoming. When the place cannot be invested or when the communications can be kept open, it is possible that, provided the works are suitably designed and armed, the garrison is of good quality, and the defence is properly organised, a defence of indefinite length could be made. But such passive defence can never lead to strategical success, and therefore will not by itself win the war. To secure this end offensive operations must be undertaken either by an external force or by the garrison itself.

¹ Von Tiedemann, "Siege Operations in the Campaign against France."

The part played therefore by the fortifications comes in either case to be the same. It consists in gaining time, either to admit of strategic action by external forces, or for the re-organisation and reinforcement of its own defenders.

Though this is the utmost that can be expected of fortification, it is none the less of supreme value. Time is of the essence of strategy, and the holding of superior forces in check for the purpose of gaining time lies at the root of every strategical conception. In the next chapter will be discussed the principles by which this action can be brought about, and the methods by which they have been applied in the past.

CHAPTER III

THE FIRST AND SECOND PRINCIPLES OF LAND DEFENCE—EARLY FORMS OF DEFENCE WORKS—CHANGES BROUGHT ABOUT BY IMPROVEMENTS IN WEAPONS—USE OF EARTH—GEOMETRICAL FORMS—THE BASTIONED TRACE—VAUBAN—THE THIRD PRINCIPLE OF LAND DEFENCE—TACTICAL CONSIDERATIONS—VAUBAN'S METHODS IN THE ATTACK OF FORTRESSES—CARNOT—THE POLYGONAL TRACE—DETACHED FORTS—NINETEENTH CENTURY FORTRESSES

THE question that we have to ask ourselves now is how the ends aimed at in fortifying a position can best be brought about, that is to say, what conditions should be fulfilled by works designed to enable superior forces to be held in check for as long a time as possible. The answer to this question may be looked on as embodying the first principles of fortification, and therefore requires to be carefully considered. It is believed that the teachings of all past history, as well as the experience of our latest war, alike bear out the opinion that the following are the prime conditions which every defensive work should fulfil.

1. It should admit of the utmost possible scope for the effective use of the weapons employed by the defenders.

2. Conversely, it should restrict to as great an extent as possible the effect of the attackers' weapons.

These conditions apply equally to all times and all weapons, to the days of pikes and broadswords, of bows and arrows, battering rams and catapults, and to those of magazine rifles and quick-firing guns. These principles

were acted on by the builders of the walls round Rome and Carthage, and by the Boers in their defences guarding the passage of the Tugela. As long as war exists they will be the leading principles of defensive tactics.

It has sometimes been stated that one of the principal functions of a defensive work is to offer a material obstacle to the assailants' advance. This, however, is a fundamentally erroneous conception. Neither now nor at any former period has the offering of a material obstacle been a principal function. It is true that before the era of rifled weapons defensive works did as a rule offer a material obstacle, but this was solely because that was the simplest manner of fulfilling the condition above laid down of affording the best scope for the use of the defenders' weapons. An obstacle, however difficult, can never *per se* be an effective bar to the passage of resolute men, but while in the act of negotiating an obstacle the assailants must always be in an unfavourable situation for using their own weapons and also greatly exposed to the application of those of the defenders.

Probably the earliest recorded forms of defensive works are walls and towers. When the weapons of both the attackers and the defenders were spears and broadswords, it is easy to see that such forms amply fulfilled the conditions laid down above. These weapons could only be used at close quarters, and to attain to this it would be necessary for the assailants to climb the wall. While in the act of doing this they would be unable to use their weapons, while the defenders standing on the top of the wall would have good opportunities for the effective use of theirs on the persons of their ascending foes. One man in such a position could keep off a good many climbers.

When the use of bows and arrows came in, the

attackers were able to use their weapons before coming to close quarters. To render them ineffective, therefore, the defenders resorted to sheltering themselves behind something which the arrows could not penetrate. The tops of the walls were therefore crenellated. As the weapons became more accurate the defenders went into loopholed towers or chambers. This may be called the beginning of the great and protracted struggle for supremacy between offensive weapons and defensive materials. This struggle, inevitable as it was, has resulted in the general acceptance of the idea that material protection against the assailants' missiles is a prime condition of defensive works. But this also is confounding the means with the end. The end is, as stated before, to restrict the effective use of the attackers' weapons. The easiest method of effecting this has generally been for the defenders to shelter themselves behind an impenetrable object; but it does not follow that this is always the only way, or even the best way, of achieving that result. For instance in the present time, when the penetration and destructive effect of projectiles has become so enormous, it has become a matter of great difficulty to find materials capable of resisting them. It is therefore open to question whether it is not more expedient to so design the defensive works that the attackers would find it most difficult to see and range on them or to observe the results of their fire, instead of burying the defenders under masses of steel and concrete. The end aimed at would be equally well secured by the former method, as it would be very difficult for the attackers to score an effective hit, while the grave disadvantages of the latter method, namely, the hindrance to freedom of action and the difficulty of supervision and control, would be avoided. This question, however, will be discussed fully

in another place ; it is only introduced here to show that material protection against projectiles is not a fundamental condition of a defensive work, any more than is a material obstacle to the attackers' advance. Both are only means of attaining the conditions laid down at the beginning of this chapter.

To take up again the progressive developments of defence works. For a long time the defenders in their loopholed castles and battlemented walls retained their advantage. To enable them to use their missiles against escaladers, overhanging galleries were constructed. To destroy these and to batter in doors, the attack brought catapults and other engines hurling great stones. The defence then sought to defend the foot and faces of the walls by building the latter on an indented trace, and thus bringing a flanking fire to bear. Here were the germs of that great elaboration of geometrically designed traces which distinguished the fortifications of later centuries. With indented traces the salients were the points offering the greatest facilities for attack, as the frontal defence there was weakest, and the limited range of the defenders' missiles rendered the flanking defence there less effective. The salients were therefore strengthened by making the walls extra thick, and throwing out sharp beak-like buttresses, also by building great towers on them.

The invention of gunpowder, and the introduction of cannon early in the fourteenth century, foretold the doom of masonry walls and towers for defence purposes, though a very long time elapsed before they produced much effect. It was not till the end of the fifteenth century that artillery became so powerful as to be able to make certain of shattering such defences. Masonry walls then ceased to fulfil the prime condition stated above for

defensive works, namely, to restrict the effect of the attackers' weapons, and it became necessary to find a substitute. The substitute was found in earth.

The use of earth came in slowly; at first it was only employed as a backing to masonry walls, and in forming screens before gateways and other weak points. But as artillery improved defenders were confronted with a dilemma. It was necessary that their walls should have high command, in order to increase the scope and effect of their own fire and also to guard against assault; but the result of this was that these high walls could be readily shattered by the attackers' artillery, so, instead of restricting the effect of the latter, they formed a large and vulnerable target for it. The compromise that resulted from this formed an important step in the development of fortification. The wall was retained as a defence against assault, but was partially or entirely sunk in a ditch. Above the wall was given a stout earthen rampart to give command; this was difficult to injure with the round shot of that period. The earth for the rampart was taken from the ditch, which thus became broad and deep; so that besides screening the wall it formed an obstacle in itself, and led to the detention of the attackers on its brink under fire.

The ditch with masonry escarp wall remained a leading feature in all works of fortification for many centuries, and has even survived to the present day. It is evident, however, that it is only a means to the ends stated previously; and, although in the period before the introduction of rifled small arms it was, when provided with adequate flank defence, the most suitable and efficacious means, yet there is every reason to believe that in these days those ends can be equally well attained by far simpler means. On this point more will be said in another place, but it is

mentioned here because from long custom the necessity for a ditch has tended to be looked on as an essential element of a defensive work. It is evident, however, that neither a ditch nor any other special material feature is an essential element in fortification. It is important to lay stress on the fact that it is the end that should be looked to and not the means, and that the only essential element of fortification is to so design the works as to apply in the simplest manner possible the fundamental principles of the art to the weapons and tactics of the day.

After the introduction of the earth rampart with ditch and escarp wall the development of fortification is easier to trace. It became evident that once the attackers had succeeded in descending into the ditch, the defenders behind the earthen ramparts could not bring their weapons to bear on them, so the former were able to re-form and arrange for escalading the wall without disturbance. Even the indented trace did not remedy this, as there were generally parts of the foot of the wall not visible from any part of the parapet, and also the fire of the defenders on the ramparts could be kept down by parties posted on the glacis of the ditch. Loopholed casemates and caponiers were therefore introduced to bring a fire along the bottom of the ditch.

The bastioned trace was the reduction to systematised form of the above developments. It was introduced by the Italian engineers in the sixteenth century, and subsequently employed all over Europe. It was particularly in France, however, that it attained its greatest development and lasted the longest. An immense variety of accessory innovations were also imposed, such as ravelins and outworks of all sorts, tenailles, retrenchments, keeps, &c., all of which were for the purpose of keeping the

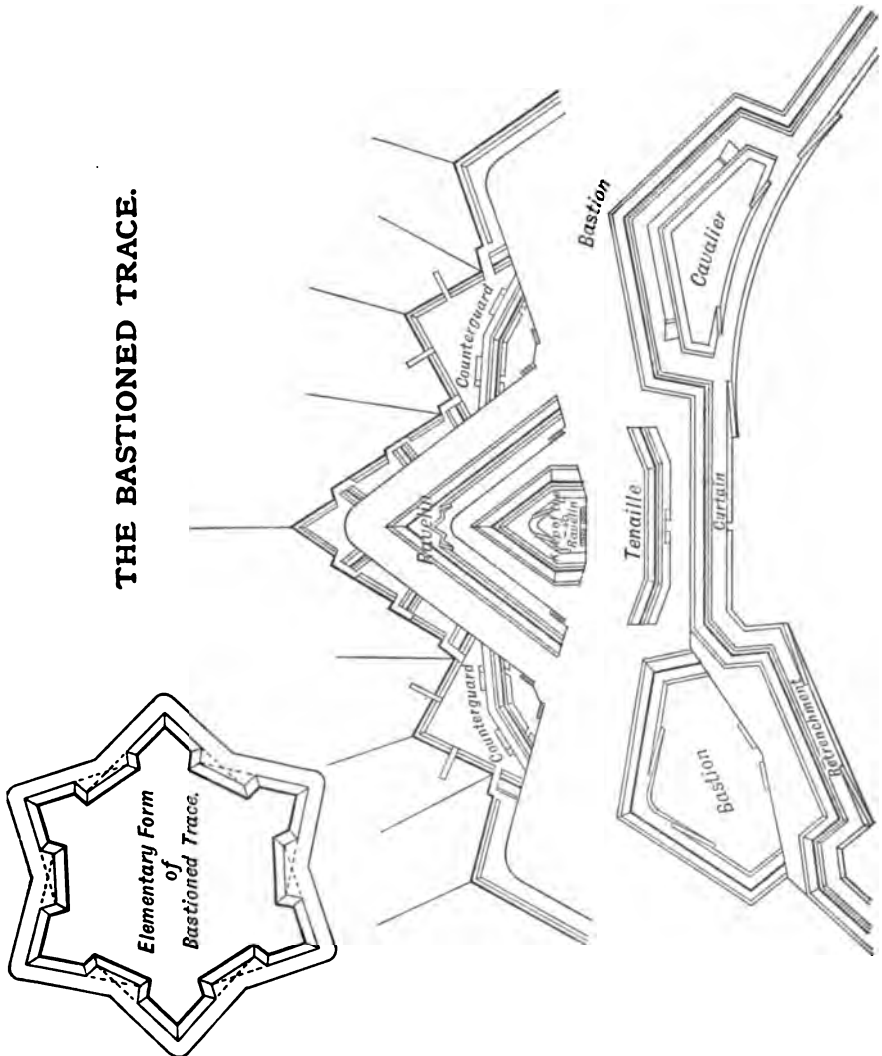
attackers as long as possible under fire and of prolonging the resistance step by step, and accordingly further fulfilling the primary conditions of the defence.

In the latter half of the seventeenth century the art of fortification on the bastioned trace received a great impetus from the influence of Vauban, who reduced it to a systematised form, and is reputed to have constructed or remodelled no less than 160 fortresses in France. Vauban's methods, however, can hardly be said to have achieved results proportionate to the vast labour and expenditure they entailed, but whatever measure of success can justly be claimed for them probably depended entirely on the degree in which they embodied the proper application of the eternal principles to the weapons and conditions of the day. The geometrical systems which are reproduced in the text-books under the name of Vauban's first, second, and third systems, and the dogmatic theories based upon them, were not actually laid down by him, but were mostly formulated by his followers afterwards. There was at first no absolute rigidity about his methods, in fact he varied them considerably in accordance with the circumstances of the site. He even wrote that "one does not fortify by systems but by good sense and experience," an adage that might advantageously be printed at the head of every text-book as an antidote to theory and dogma. Towards the end of his career, however, it would seem that he fell away from this sound principle. At all events he was responsible for the construction of a great number of fortresses the strategic value of which is doubtful, and in the design of which the elaboration of geometrical artifices appears to have been given the precedence over tactical requirements.

When criticising the works of the Vauban period it is necessary to bear in mind the nature of the weapons of that time. The fortress artillery had a range of about 600 yards, and the musket of not much over 200. Even at these ranges they were far from accurate, and the decisive ranges were about half the above. The attackers, therefore, had but a short distance to pass over under effective small-arm fire. Moreover, the density of the fire to which they would be subjected during that period of the advance would not be very great, on account of the slow rate of the defenders' fire, due to the time taken in reloading. The decisive phase of the attack was therefore within about 100 yards of the parapet, and every effort was rightly made to delay as far as possible the attackers within that zone, and to concentrate on them while there as heavy a fire as possible.

It will be seen how the bastioned trace and its accessory devices at first all tended to the accomplishment of this perfectly legitimate end. The frontal fire from the parapets was arranged so as to graze the glacis. The flanks of the bastions were intended to bring a fire from their parapets, and also perhaps from escarp galleries, along the ditch of the curtain and of the opposite bastion; this raking fire would evidently be most destructive to the crowded ranks of the assailants when endeavouring to escalate the wall or mount the breach. Sometimes guns were mounted both on the parapets of the flanks of the bastions and in the escarp galleries to fire along the ditch. The *tenaille* was intended primarily as a cover or screen to the escarp wall of the curtain, so as to prevent it from being breached, this part being otherwise exposed, owing to the greater width of the ditch in front of it. The exit from the place also generally led through the curtain, and the *tenaille*

served to cover this. The ravelin was an advanced work in front of the curtain to still further protect it,



and also to bring a flanking fire over the ground in front of the salients of the bastions, and thus to force

the attackers to capture the ravelin before they could assault the bastions.

To still further push outwards the point on which the besiegers must make their first attack, and to delay them by a step-by-step resistance, other outworks, known as horn-works, crown-works, demi-lunes, &c., were constructed in front of the ravelins and of the salients of the bastions. At important parts of the line retrenchments, consisting of an independent parapet or ditch, were provided behind the main parapet, so that if the latter were breached and stormed the attackers would be confronted by another fortified line. Each of these successive lines was arranged to command and fire into those in front of it. Cavaliers of still greater command were imposed on specially important bastions, and finally a keep or citadel was generally added in which the garrison might take refuge when the main lines had fallen, and in the trace of which most of the above artifices were repeated.

Theoretically all the above contrivances would appear to fulfil the two principles previously stated as essential to defensive works. The elaboration of flank defence, the care taken to avoid having any undefended ground in front or in the ditches, resulted in the prolonging of the time during which the attackers remained under fire at decisive ranges, and thus fulfilled the condition of affording the utmost scope for the defenders' weapons. Also the tenaille and the outworks prevented the escarpments from being breached by distant fire, and the thick earth parapets, the traverses on faces exposed to enfilade, and the method of firing the guns through embrasures, protected the defenders, and thus these methods of design fulfilled the condition of restricting the effect of the attackers' weapons.

This great elaboration of the linear defence was not,

however, without certain dangers. Though it fulfilled the two primary principles mentioned above, yet it often violated another one which is hardly less important. This principle, which may perhaps be called the third primary principle of fortification, is one which is common to all tactical action whether on the defensive or the offensive. It consists in the necessity for providing for the possibility of concentrating superior force on the decisive—*i.e.* the threatened—points, in other words, of allowing of freedom for tactical handling of the defenders.

This principle has not been mentioned before because in the mediæval defences, consisting generally of castles or towers, or comparatively small walled enclosures, there was no difficulty about its attainment. But when defensive works took the form of great belts of geometrically designed ramparts encircling large towns, when the lines consisted in a mass of ditches and scarps, ramparts and galleries, arranged in a manner that appeared beautifully precise and exact on paper, but which became a bewildering maze to any one trying to find their way about them on foot, when the garrisons were scattered about in little detachments each with independent duties, and the guns were posted in ones and twos firing through narrow embrasures in a single direction only, it is evident that the control and handling of the fighting forces would be a matter of much difficulty, and freedom of action would be greatly restricted.

It is true that this was seen at the time, and to a certain extent allowed for. Passages and covered ways of communication, ramps and steps, were provided to give access to all parts of the lines. But with every addition of geometrical refinement it became increasingly difficult to secure tactical control and free communication between parts, and in many of the more elaborate works con-

structed about the end of the seventeenth and beginning of the eighteenth centuries, it would seem that the fascinations of line and angle had carried away the designers to the extent of making them neglect tactical requirements. At all events the development of this geometrical style of fortification led to the art being drawn more and more entirely into the domain of technical experts, and more and more divorced from that of the soldier, with the result that important military requirements were often sacrificed.

About this period immense sums of money were lavished, particularly in France, in providing great numbers of huge fortresses, many of which never justified their existence from a strategic point of view. Those even that underwent attack generally failed to display defensive capacities of an order anything like proportionate to the enormous labour and expense involved in their construction; many in fact of the most heavily fortified places surrendered after a feeble resistance, while some others, in which the works were hastily thrown up almost in the enemy's presence, and which therefore probably more nearly fulfilled tactical requirements, offered stubborn and protracted defences.

It is difficult indeed to discover any adequate grounds for the great reputation achieved by Vauban as a designer of fortification, still less for the almost reverential admiration of his works and methods which survives in certain quarters even to the present day. It is very doubtful whether his fortresses even in their own day had a value proportionate to their size and cost, and it is certain that as weapons improved his methods became utterly obsolete. Yet they were retained long after the conditions that called them forth had departed, and this retention cramped and fettered the art of forti-

fication, and was largely instrumental in bringing about the discredit into which the latter has fallen of recent years.

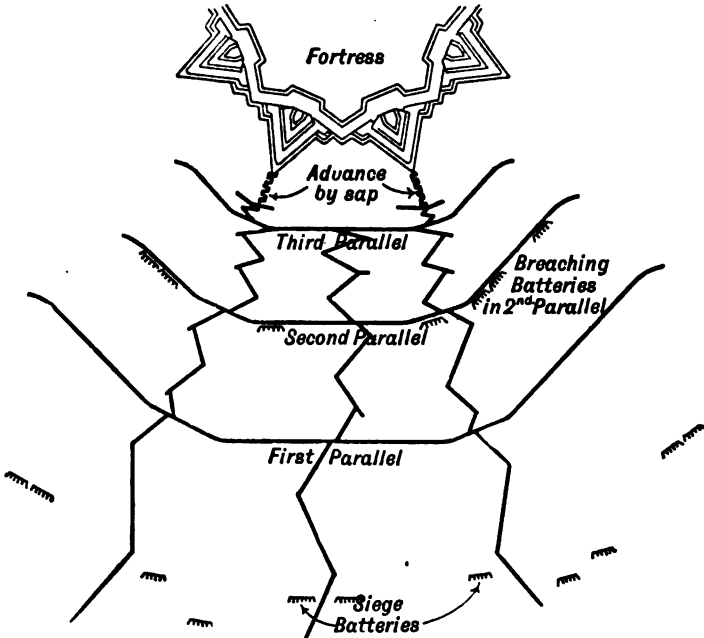
It has been said that the failure of the seventeenth-century fortresses to do what was expected of them is attributable to the great improvement which took place about that time in the organisation of the attack. But even if this were true it would be a poor reason, for it is tantamount to an admission that they were ill adapted to the tactical conditions even of their own day. It is, however, true that the methods of the attack of fortresses underwent at that time a great regeneration and improvement, and this change has had a much greater and more lasting effect upon military art generally than has all the inventions of the fortress engineers.

It is a curious example of the irony of fate that the improvements in the methods of the attack, which resulted in the latter being for the first time endowed with a distinct superiority over the defence, was due to the same mind as evolved the elaborate developments of the defence. It was Vauban also who was the author of the well-organised system of attack which has been employed by besiegers practically ever since, and who was the first himself to prove its value in a great number of siege operations which he personally conducted. This achievement alone would have entitled him to an honourable niche in the temple of military fame if he had never built a fortress at all.

It will be advantageous, as an assistance to the proper comprehension of the tactical requirements of the defence, to give a short account of the system of attack initiated with such success by Vauban. The object which the besiegers had by some means or other to encompass when confronted by a fortress of the type

described above was to pass over the open ground in front of the fortress, which was swept by the defenders' fire, with a view to penetrating into the place. In order to achieve this the advance was made by means of

THE FORMAL ATTACK OF A FORTRESS.



trenches known as parallels and approaches, so as to give cover to the attackers, and batteries of siege guns and mortars were established with a view to keeping down the fire of the defenders and eventually effecting a breach in the escarp wall by which the storming parties could enter. The batteries were low earthen structures difficult to see or hit. The approaches were laid out in a zigzag form, each branch being aligned

so that its prolongation passed clear of the fortress, in order to guard against enfilade fire. The parallels formed lodgments for the attackers' covering parties. Vauban's achievement was to reduce the whole of this process to an orderly and regular system.

Batteries were first thrown up at long artillery ranges, and by bringing a large number of pieces into action an endeavour was made to counterbalance the superior calibre of the fortress artillery and to subdue its fire. Meanwhile, the defenders' outposts were gradually pushed back by those of the besiegers, and on a favourable opportunity the first parallel was opened at long musketry range, communications into it from the rear being constructed at the same time. Depots and parks for stores and ordnance and magazines for ammunition were at the same time provided, and the completest organisation prepared for working parties and covering parties and other services. When the fire of the fortress had been to some extent subdued the second parallel was opened and its approaches made, but if the defence was active it might be necessary to push out the latter by sap and to connect the heads to form the parallel. New batteries were made in the second parallel, and some of the artillery brought into them in order to silence the fortress guns at short range and to prepare a breach at the point selected for attack. In a similar manner saps would be pushed out from the second parallel and eventually connected into the third parallel, and if possible some guns brought up into the latter for the purpose of breaching the escarp at short range. The third parallel would usually form the starting point for the storming columns, but if the activity and resolution of the defenders were such as to make an advance from this point too hazardous, recourse might be had

to further sapping and the formation of fourth or fifth parallels, or to mining with a view to blowing down the counterscarp. It might even be necessary to sap across the ditch and mine under the escarp wall.

The above system, if properly organised and resolutely carried out, made the siege of a fortress a slow process but very sure. Sooner or later the besiegers would by its means arrive at the ditch of the place, and the rate of progress would be governed mainly by the nature of the ground and the activity of the defenders. Almost the only way for the latter to effectively retard the besiegers' operations was to make constant counter-attacks with a view to driving off the working parties and destroying the works, and to make counter-mines for the purpose of blowing up the attackers' mine galleries. But works constructed on the complicated geometrical methods described previously were as a rule unfavourable to the delivery of organised counter-attack or to an active defence at all. Be this as it may, it is certain that systematic siege operations nearly always proved their superiority over fixed defences, and the more elaborate the latter, the less as a rule was the time they held out.

The bastioned trace continued to be the prevailing form of fortification throughout the eighteenth century. Various developments and amendments were imposed on it by Cormontaigne and others, but none of these appear to have been of great value or to have materially added to the power of the defence. Towards the end of that century, however, opponents of the bastioned system began to arise. Montalembert pointed out some of its disadvantages, namely, the weakness of the curtains and of the flanks of the bastions, the cramping of the front, &c., and proposed as a remedy a tenaille form of trace,

which he ultimately modified into what was afterwards known as the polygonal trace.

Carnot, who was probably the ablest of all the exponents of the defensive art, followed Montalembert in his preference for the polygonal form of trace, though he considered a modified form of the bastioned trace suitable for certain situations. Carnot, who at the special request of Napoleon I. wrote in 1810 the celebrated treatise *De la Défense des Places Fortes*, laid special stress on the necessity for counter-attack to retard the besiegers' operations, and to facilitate these proposed to abolish the counterscarp wall and substitute a gently sloping bank to enable the sortie parties to issue from the ditch on a broad front. As an obstacle in the ditch he introduced a detached wall. As might be expected from a disciple of the great Napoleon, Carnot gave a greater importance to tactical requirements generally than had been done before his time; he also urged the employment of high angle fire against the besiegers' works, though his enthusiasm on this subject led him into extraordinary and unpractical statements and calculations.

The new ideas took rapid root in Germany and Holland, where most of the works constructed since the beginning of the nineteenth century have been of the polygonal type. France, however, notwithstanding the pleading of Montalembert and Carnot, continued to adhere to the bastioned trace and the Vauban style of fortification. The difference between the polygonal and bastioned systems lies in the main line of defence of the former being traced in the form of the sides of a polygon. Each of the sides was straight, and flank defence was obtained from powerful caponiers in the ditch instead of from bastions. The caponiers were protected by ravelins in front of them. This system was more suit-

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able for broad wet ditches than the bastioned, and the frontal fire obtained was greater, the interior space not so cramped, and communication and counter-attack easier. But, like all geometrical systems, it readily lent itself to the multiplication of accessory artifices at the expense of tactical requirements; counter-guards and horn-works, orillons, retrenchments, cavaliers, and reduits are found in polygonal fortresses as in bastioned ones. The caponier develops into an immense masonry fort



with two or three tiers of musketry and artillery defence, sometimes even provided with barracks and a parade ground inside, and requiring additional caponiers to defend its own sides. The superiority of this type over the older one becomes in such cases hardly at all marked. The most notable example of the polygonal type of fortification is the enceinte of Antwerp.

Up to about the middle of the nineteenth century the improvement in weapons was very gradual, and no striking developments of fortification took place. The introduction of rifled weapons and the increased range and power of artillery made it imperative to keep the attackers at a

distance from the place defended, and to force him to commence siege operations afar off. This resulted in the adoption of chains of detached forts outside the old enceintes.

Detached forts had been used on many occasions before this, principally to fulfil certain special functions. At Colberg in 1807 and at Badajos in 1811 and 1812 their value was made evident. But a most striking example of the employment of a chain of such works in lieu of a continuous line of ramparts and ditches was exhibited by the Duke of Wellington at Torres Vedras in 1810.

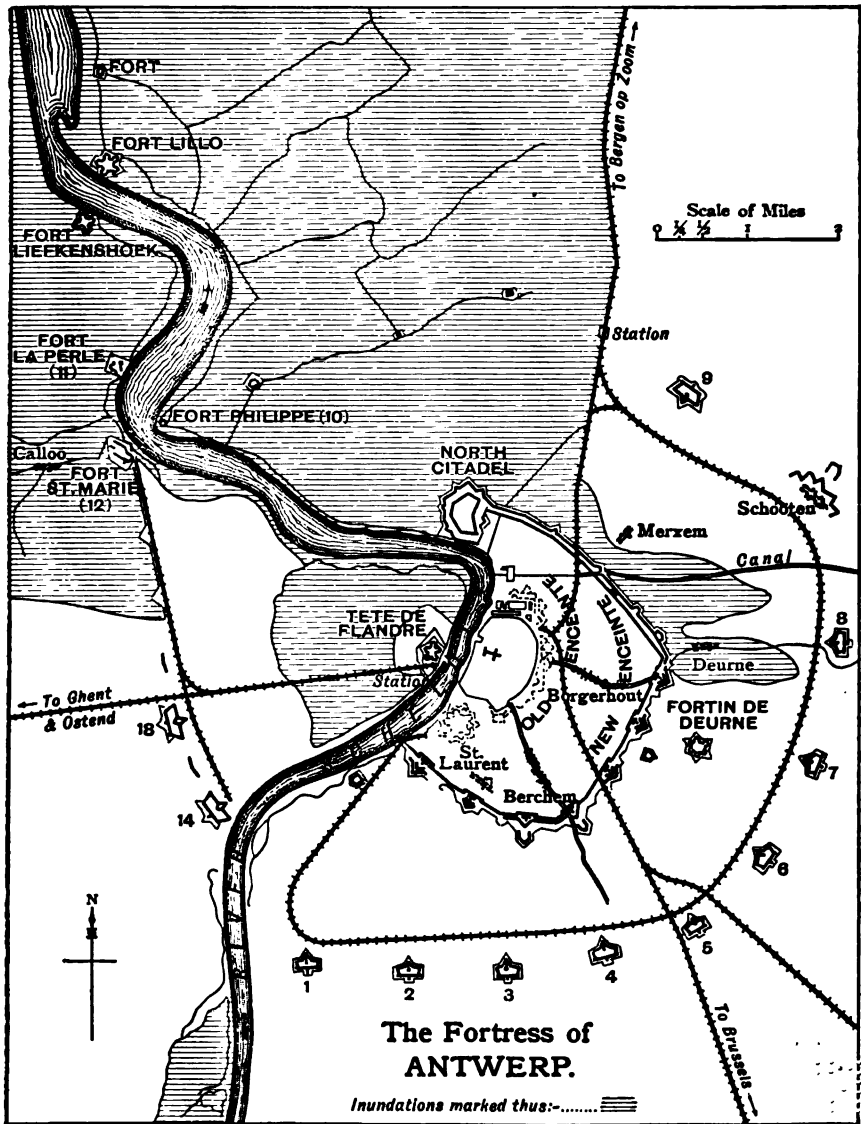
The Linz Towers, constructed in Austria in 1830, were the first example in permanent fortification of the defence of a position solely by detached forts. These works, which were strong, circular, masonry towers for artillery and infantry defence, sunk into the ground and surrounded by a deep ditch, were disposed in a circle, or rather a girdle, round the place to be defended. It was, of course, intended that a field army should occupy the space between the line of forts and operate between them. The Linz Towers were never subjected to the test of war, but their tactical conception was eminently sound.

The defences of Paris were built in 1840-44. They consisted in a girdle of detached forts about 3500 yards apart, surrounding a continuous bastioned enceinte, and situated at distances from the latter varying from 2500 to 3500 yards. The forts, which were fifteen in number and all similar in conception, were built on the bastioned trace with deep ditches and elaborate flank defence. Bomb-proof cover was provided for the garrison and for powder storage. All the faces, including flanks and gorge, were symmetrically treated, the object of which is not

clear. Cavaliers were added in some of them, and, though there were no ravelins, hornworks were provided before the front faces of some of the more important works.

Defences on the detached fort principle were also constructed in Germany and other countries, and soon after in England. In 1859 the defences of Antwerp were commenced. As it was intended that Antwerp should be the very centre and kernel of the national defence in Belgium, all the resources that science and skill could bring to bear and wealth could command were lavished on the works. The enceinte surrounding the town is an irregular curved line about nine miles long, resting at both ends on the river Scheldt. It is divided into eleven fronts on the polygonal system. The main ditches, which are wet, are from fifty to eighty feet broad, and flank defence is provided by a powerful caponier in the centre of each front. The caponiers are protected by counter-guards and ravelins in front, while behind each of them is a great two-storeyed defensible casemated barrack which acts as a cavalier and keep, and brings a flanking fire along the rear of the main parapet. There is a polygonal citadel of similar design at the north end of the enceinte, abutting on the river Scheldt, and surrounded, except on the city side, with inundations, or with ground capable of being inundated. A considerable portion of the ground in front of the enceinte is also capable of being inundated.

In advance of the enceinte, and from two to three miles from it, is a chain of large and powerful detached forts about one and a quarter miles apart. Each of these forts was intended for an armament of 120 guns and 15 mortars, and required a garrison of 1000 men. Their ditches are wet and flanked by powerful caponiers.



Walker & Cochran sc.

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There is unfortunately but little experience available as to the behaviour under the conditions of war of a fortress of this nature, that is to say, provided with a chain of permanent detached works. Of the numerous places that were besieged in the Franco-German war only Metz, Paris, and Belfort were so provided. Even here the test was hardly a fair one, for the power and range of offensive weapons had greatly increased since these works were built in 1840, so they were called upon to face conditions which were not anticipated when they were designed. The sieges of the places named above will be discussed in another chapter.

We can, however, inquire how this method of fortification conforms to the principles stated in the earlier part of this chapter to be essential to all defensive works. The pushing out of the line of defence to a distance from the place to be guarded, where the latter is a material object such as a town, &c., is a correct development, and accords with the condition of restricting the effect of the attackers' weapons, as it keeps them out of range of the place. The line thus taken up becomes, however, greatly extended, and splitting it up into a series of separate works, which are capable of defending the intervals between each other as well as their own front, is preferable to having a long continuous line, as it better fulfils the condition of permitting of tactical control and freedom of action, and allows of concentration of force upon important points. It also gives full facilities for active defence and for counter-attack. Whether the detached works themselves conform to the condition of giving the fullest scope to the effective use of the defenders' weapons and restricting that of those of the attackers depends entirely on how they are designed. It does not appear, for instance, that these conditions were adequately fulfilled

in the detached forts round Paris in 1870. In those works the elaboration accorded to flank defence detracted from their power of frontal fire, which, with weapons of the range and power of those of that day, was of far the greater importance. Moreover, the form of the trace exposed the parapets to enfilade and reverse fire. The escarps and casemates were in many cases exposed, and were therefore easily breached and destroyed by the besiegers' artillery. These defects were not due to the improvements in armaments which had taken place between the time they were built and 1870, as they would also have been observable with the weapons and conditions of 1840; they can only be attributed to faulty conception. There is, however, no reason why detached forts should not, if properly designed, amply fulfil the two conditions last mentioned, and, though instances of permanent works having done so are lacking, there are eminent examples of provisional works thrown up in war time—sometimes actually in the presence of the enemy—having been completely successful in doing so. The cases of Torres Vedras and Plevna will naturally occur to every one in this connection.

It would appear that a girdle of detached forts requires some second and interior line of defence, in case one or more of the forts are captured or the line penetrated through the intervals. Whether or not this second line should take the form of a continuous enceinte round the town or place guarded is a question that has in the past been hotly contested. Many arguments have been brought up to support both views, but space does not admit of the point being discussed in this chapter, though it will be dealt with later. In most continental fortresses the interior line does consist of a continuous enceinte, but this is due to the fact that these enceintes existed from

an earlier date, and a belt of detached forts outside them has been added later; to modify and bring up to date the existing enceinte was in such cases the simplest and least expensive manner of providing the interior line. Antwerp is almost the only example of a first-class fortress having actually been provided with a new enceinte since the introduction of rifled guns.

The last quarter of the nineteenth century witnessed, as we know, the most gigantic strides in the power of small arms and of ordnance of every description. The flat trajectory and long range of rifles, mechanical improvements in loading arrangements, which have brought about a density of fire fifty times greater than was possible in muzzle-loading days, the enormously increased range and power of artillery, the introduction of accurate high angle fire, and of shell with large bursting charges of high explosive, all these have brought about a state of affairs which is as far ahead of the conditions of the days of the Crimean war as the latter were of those of the sixteenth century. Under these circumstances it is natural that theories of fortification should have undergone a revolution. War experience under the new conditions having been till two or three years ago wanting, a certain amount of chaos in thought and practice have resulted. Widely divergent theories have been propounded, some have proclaimed that the days of permanent fortification are past, that the defensive has been killed by the new weapons; others that salvation can only be found in the adoption of steel armour and of massive concrete protection; others again have held that the essential principles can still be attained without any such heroic measures—that earthworks designed with tactical judgment will be found to-day to fulfil requirements no less successfully than in the past. The discussion of these matters requires an-

other chapter, but before proceeding to it, it is considered expedient to review some of the principal events in the history of siege warfare in the past, to endeavour to analyse the causes of the results obtained, and to observe their bearing on the principles of the defensive art.

The writer is conscious that this chapter has been but an imperfect and superficial sketch of the development of defensive methods in the past. This book, however, is not intended to be a history of fortification, but only an endeavour to elucidate the principles which should govern the mode of designing defensive positions, with a view to applying them to the conditions of the present day. A general knowledge of the methods adopted under the varying conditions of past times is necessary to this end, but an attempt at a detailed history would be out of place.

CHAPTER IV

DIFFICULTY OF ANALYSIS OF CAUSES OF SUCCESS OR FAILURE IN
SIEGES—SIEGES OF THE WARS OF MARLBOROUGH AND
EUGÈNE—TACTICAL CONDITIONS PREVALENT AT BEGINNING
OF EIGHTEENTH CENTURY—LIÈGE—LANDAU—BRISAC—TURIN
—MENIN—TOULON—LISLE—GHENT—TOURNAY—MONS—AIRE
—GENERAL LESSONS DRAWN FROM THESE OPERATIONS

It is proposed in the next few chapters to deal with a few of the principal and most instructive sieges of the past. It will be necessary to briefly review the tactical conditions of the times in which they took place, to inquire to what extent the works fulfilled the conditions which it is believed are essential, and which have been set forth in the previous chapter, and to endeavour to analyse, as far as is possible from the materials available, the causes that led to the results achieved in each case under review.

Nothing is more difficult than to correctly analyse the causes of success or failure in the attack and defence of fortresses in past times. The reason of this is that the causes are, as a rule, very complex, and that the suitability or otherwise of the works is only one, and probably far from the most important one, of them. There are a great number of conditions which enter into each case, and many, or all of them, may have had a bearing on the result. The activity of the garrison, the organisation of the defence, the ability and resolution of the commander, the relative power of the ordnance, the sufficiency of the supplies, all these and

many other causes may have important effects upon the results of sieges; and also the fate of fortresses is often influenced by the tactical methods and energy of the attackers, as well as by external strategic considerations, such as the movements of other bodies of troops elsewhere.

It is seldom too that complete data on these heads are available, so wrong conclusions are often arrived at on this account. It therefore often happens that a false importance is given to one or other of the conditions in a particular case, and wrong deductions are made from the erroneous premise thus set up. It is thus seldom safe to seize upon particular events and deduce therefrom particular theories, but it is better to confine oneself to an endeavour to obtain from a general consideration of a representative siege or group of sieges in any campaign or tactical era, some general lessons in regard to the broad principles of the defensive art.

It would hardly seem necessary, in seeking examples of siege operations for the purpose we have in view, to go further back than the beginning of the nineteenth century; for before that not only were the tactical conditions so very different from those of more recent times, but also the records existing are far less full and clear. It happens, however, that one of the most important epochs in the history of the defensive art was about the end of the seventeenth century. It has already been narrated in the preceding chapter how at that period the influence of Vauban gave rise to considerable new developments in the design of works of fortification, and gave a great impetus to fort building. In the various campaigns carried on against the French by the Duke of Marlborough and Prince Eugène, during what are known as the Wars of the Spanish Succession, at the

beginning of the eighteenth century, a conspicuous part was borne by siege operations. On the French fortresses immense sums had been spent, and all over the Continent the defences had been restored and rebuilt on the principles introduced by Vauban, and in some cases actually to his designs. It would be reasonable, therefore, to expect that in these sieges, so soon following the Vauban era, some traces would be found of great advantages gained to the defensive side by the new methods. It is therefore worth while to briefly describe the principal siege operations of those wars.

The tactical conditions of those days are well known. The flint-lock musket was only accurate for about sixty yards' range, and its rate of fire was extremely slow. Bayonets were just coming in, in supersession of pikes. All the decisive fighting was practically hand to hand, and manœuvring was done at comparatively close quarters. The effective battering range of the siege guns, drakes, and culverins of the period, probably did not exceed 400 yards. Under these circumstances, the decisive zone of action was evidently the last hundred yards of the ground over which the attack must pass. We have already noticed how in the bastioned system of fortification it was sought, by a multiplication of the means of bringing a converging and flanking fire over this last hundred yards, to increase the density of the fire which the assaulting columns would have to face; and that, recognising the probability of assaults being successful even under the above circumstances, successive lines of defence were provided by means of outworks in front of the main line, and retrenchments behind it, each of which would require a fresh attack, and thus give rise to delay before the besiegers could gain an entrance to the body of the place.

It must also be remembered that the development which had been brought about by Vauban in the methods of fortification had been to a considerable extent counteracted by the improvement in the methods of siege attack introduced by the same general. The following is a short description of a few of the most representative sieges of that period; no comments will be made on particular events themselves, but at the end some general deductions will be drawn from the operations viewed as a whole, it being thought that this is the best way of avoiding error and arriving at some lessons of general application.

Liège.—The fortress of Liège in 1702 was held by the French and attacked by the allied forces. The town itself was given up and occupied by the allies, and trenches were opened by the latter against the citadel. It was agreed that the allies should make no use of the city in attacking the citadel, so that it might escape ruin. Approaches were rapidly pushed to within forty paces of the counterscarp. The attack was directed by the celebrated engineer, Coëhorn, and was of a vigorous nature, the besiegers' artillery doing great execution. By 23rd September, after ten days' siege, everything was ready for an assault. "Though nothing more was designed than to make a lodgment on the counterscarp, yet in the space of half-an-hour it was carried, and the soldiers having pushed the enemy to the breach, and made themselves masters thereof, entered the citadel on every side, which they likewise carried sword in hand."¹

Landau, 1702.—Landau was a strongly fortified town which underwent several sieges. In 1702 it was held by the French and was besieged by the Prince of Baden.

¹ All the quotations in this chapter are from "The Military History of Prince Eugène and the Duke of Marlborough," Claude du Bosc, 1736

The siege ran the usual course and displayed no feature of interest, though the defence was of a determined nature. After eighty-four days the defenders capitulated prior to an assault being delivered.

Landau, 1703.—In 1703 Landau was again besieged, this time by the French under Marshal Tallard. On this occasion it only held out thirty days, notwithstanding that the besiegers were threatened by exterior forces of the allies and had to fight a battle during the siege.

Landau, 1704.—In 1704 the French in Landau were invested by the Prince of Baden and Prince Eugène. We read that "the works were not in good condition, most of them new, and the mortar not very well settled." New works were erected "even in the sight of the enemy." After sixty-nine days' siege the place surrendered, as the principal officers assured M. de Laubanie, the Governor, that "there was no assurance that the place might not be taken by assault." The garrison had been reduced by losses from 5000 to under 2000.

Brisac, 1703.—Brisac was accounted to be "one of the strongest places in Europe." The fortifications had been designed by Vauban. The attack, however, was directed by Vauban in person. The garrison capitulated after fourteen days' siege only. The commander, Count d'Aro, was beheaded by sentence of a council of war for this disgraceful surrender.

Turin, 1706.—Turin was besieged by the French in 1706. The defence made on this occasion by the Duke of Savoy was by far the most notable of all those that took place in the series of wars under review, for it lasted no less than 136 days and ended in the place being relieved. The fortifications were not of particular strength, but were greatly added to by earthworks constructed just before the investment and also while the siege was in

progress. About the middle of May the French army arrived, and soon afterwards opened trenches against the town. The place, however, was not completely invested, and the communications remained open till the beginning of August. The defence was of a most active nature, particular energy and resolution being displayed in the execution of new works. Mining was resorted to by the besiegers, but the defenders were already prepared with a complete system of countermines and listening galleries, and these were made use of with so much address that a mastery was soon established by the defenders in the subterranean warfare. Towards the end of August the conflict became of a most desperate and sanguinary character on both sides. Successive determined attempts at assault were made, but were repelled by the desperate efforts of the defenders. In some cases the breaches were defended by quantities of faggots and other combustibles, drenched in oil and set alight, thus forming an impassable wall of flame; in others, immense quantities of shells, grenades, combustibles, &c., were showered down on the attacking columns. Countermines were formed and fired under the besiegers' works, engulfing whole companies of men and entire batteries of guns. The slaughter was enormous. On the 7th September the siege was raised by a relieving army under Prince Eugène attacking and defeating the French. The losses of the defending troops had amounted to 5000 out of a garrison of 10,000, and great privations had been suffered in the latter part of the siege from want of food.

Menin, 1706.—Menin, held by the French, was besieged in 1706 by the allies under the Duke of Marlborough. It was said to be "one of the strongest places in Flanders—well fortified, and capable of having all the country in its neighbourhood laid under water. M. de Vauban had

shown his utmost skill in the mighty works which he had raised for its defence. It was extremely well provided." The garrison consisted of 4900 of all ranks. Notwithstanding the advantages mentioned above the siege only lasted thirty days. The early part of the proceedings followed the usual course. When the saps on the right and left had reached the salient angles of the counterscarp the Duke of Marlborough ordered an assault. This was successful, and resulted in two lodgments being made on the covered way, but the assailants lost 1400 killed and wounded in the operation. Two days later the fortress surrendered. The early capitulation is said to have been due to the fact that "the terrible effusion of blood at the assault intimidated the garrison."

Toulon, 1707.—Toulon was besieged in 1707 by a combined military and naval force, the former consisting of allied troops under the Duke of Savoy and Prince Eugène, and the latter of the British fleet under Admiral Shovel, with some allied vessels. The permanent fortifications of Toulon were of no great strength. When the troops arrived on the 26th July before the place they saw "the enemy's camp, covered by a good retrenchment, under the cannon of the place, its right wing towards the town, its left towards the mountains, but in such a manner that it could not possibly be attacked. We conceived that the place was not very strong in itself, but that in making any attempt upon it we must be exposed to a prodigious fire from a numerous artillery admirably well disposed, the more because it was impossible for us to cut off the communication of the city with the army, or absolutely to invest the place."

The defence was of a very active nature, but the besiegers took one or two outlying forts. On the 20th August the besiegers became aware that the French

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expected great reinforcements, so they began to embark the artillery and ammunition. The next day the fleet heavily bombarded the town and harbour, and set the former on fire. The same night the army marched off.

It would appear that in this operation Prince Eugène had attempted a task beyond his strength. The forces brought up were quite insufficient, and, as the place contained immense quantities of stores and ammunition, besides a valuable harbour, it might have been known that the French king would put forth a mighty effort to keep it.

Lisle, 1708.—Lisle in 1708 was an exceedingly strong place. The French king "had spared neither pains nor cost in fortifying and adorning it. The famous M. Vauban erected a citadel the most regular and at the same time one of the strongest that had ever been seen. . . . The town itself was also fortified in such a manner that it was held impregnable." In fact, the fortress was a typical example of the Vauban methods of defence at the highest and most elaborate stage of their development. M. de Boufflers was the governor. "On the whole the French were so sanguine that they fancied the place to be out of danger; and the great Duke de Vendôme is reported to have said 'he did not think so wise a commander as Prince Eugène would venture on so rash an undertaking.'"

On the 13th August, Prince Eugène and the Duke of Savoy invested Lisle, while the Duke of Marlborough with 75,000 men covered Prince Eugène by a camp of observation. The besiegers had 120 pieces of battering cannon and 50 mortars. "Never was any siege carried on with greater vigour, nor any place defended with greater bravery and boldness; but the Marshal de Boufflers became quickly sensible, from the prodigious

fire made by the besiegers, that the town must inevitably fall into their hands."

"By the 6th September Lisle was in a miserable condition, there being two open breaches, and no less than 150 pieces of cannon and mortars playing continually." On the 23rd the covered way was captured by assault. About this time the besiegers' army was in much distress for ammunition and necessaries, but on the 1st October a large convoy arrived, after having been unsuccessfully attacked by a French force under the Count de la Motte at Winendael. On the 3rd October the outworks were stormed, and a lodgment made on the ravelin and two counterguards captured. On the 23rd October Marshal Boufflers surrendered the town and fortress, after a siege of sixty days' open trenches, but was allowed to enter the citadel with the garrison.

The besiegers have been considered greatly to blame over the length of this siege. It is said that the engineers' attacks were ill-judged, and that their artillery fire was not so effective as that of the town. The defence was of an active nature.

Hostilities against the citadel were recommenced on the 29th October, but it held out till the 6th December.

Ghent, 1708.—Ghent in 1708 was a very strong place, and was garrisoned by a large French army. Special orders were sent for it to be held to the last. It was invested on the 18th December, trenches were opened on the 24th December, and the fortress capitulated on the 29th December. This feeble result was due to the incompetence of the commander, Count de la Motte.

Tournay, 1709.—Tournay in 1709 was very strongly fortified. Louis XIV. "spent one million in fortifying it. The citadel was looked upon as a masterpiece of M. de

Megrigny, one of the first engineers in the world," who moreover was in command therein. The garrison was strong, and the place "well stored with powder and ammunition of all sorts, but scantily furnished with provisions and money."

It was invested on the 27th June, and trenches were opened on the 7th July within half-musket shot of the town. "The siege was carried on with the greatest vigour imaginable." On the 28th July, after only twenty-one days' open trenches, "M. de Surville (the governor) perceiving that the breaches in the body of the place were large enough to be attacked," surrendered the town, and retired into the citadel with 3000 foot and 500 dismounted dragoons. The allies had lost 3210 killed and wounded in the siege.

Hostilities against the citadel were renewed on the 1st August, and on the 3rd September, M. de Surville was obliged to surrender, "there not being an ounce of meal of any sort left."

We have here a striking example of the fatuity of spending a million on elaborate fortifications, and neglecting to properly provision the place.

Mons, 1709.—Mons in 1709 had "fortifications regular and well-contrived," walls of great extent with three deep ditches. The adjacent country could be laid under water. The siege was carried on with "extraordinary vigour." In thirty days the breaches were practicable, "and the besiegers made great preparations for a general assault; the garrison immediately hung out two white flags, one at each attack."

Aire, 1710.—Aire in 1710 made a good defence. The place was "wonderfully strong by nature, having on three sides a flat marsh, so that no approaches can be made, but on the fourth side only." It had "ten bastions, two half-

moons and two hornworks, and on the side by which it is most approachable the strong fort of St. James." It was invested the 6th September, and trenches opened the 12th September. The trenches were continually flooded by the defenders opening sluices and letting water in, and the besiegers were continually employed in draining them. "Never were people more fatigued; nor did ever any besieged place make a more terrible fire. As soon as the besiegers lodged themselves anywhere their lodgment was blown up, and when they established themselves on its ruins M. de Goebriaut sent such clouds of bombs, carcasses, and large stones, as made them glad to leave them."

On the 8th November the saps being joined, and all the necessary preparations made to storm, the place surrendered after fifty-eight days' open trenches. The allies lost in this siege 7000 men.

On considering the group of defence operations which have been briefly described above one is somewhat struck by the poverty of the results achieved. Only two, Turin and Toulon, achieved ultimate success by holding out till relieved, and of these Toulon was evidently attacked with inadequate means. Of the others the average duration of the defence made only amounted to about thirty-eight days, and if the remaining sieges (not described) of the same war are included, the average falls to about thirty-four. This must be considered very low, when the lavish expenditure that was incurred on the various fortifications is taken into consideration. Another remarkable feature is the way in which all the fortresses surrendered without waiting for an assault upon the body of the place. Liège was the only one that actually fell to assault, and in this case it was entirely by accident; the troops engaged in the attack upon the outworks apparently overdid their part, and pushed on through the breach in the main work

without giving the defenders a chance of surrendering. In all the other cases, without exception, as soon as the breach in the body of the place seemed in the opinion of the defenders to be ready for attack, a capitulation was made with the utmost celerity. This practice, which appears curious to us who are accustomed to the stubborn and protracted defences of the nineteenth century, was probably due, partly to the tactical conditions of that time, which, as has already been explained, were such as to offer but little power of resistance to assault, and partly to the customs of war which prevailed in that age. The humane and honourable practice which prevails at the present day in regard to the treatment of prisoners of war, is a thing of comparatively recent growth. The more heroic the resistance the greater is the honour accorded to the vanquished, and this courtesy is considered to reflect equal credit on the victors as on the recipients of it. Civil populations also, unless guilty of overt acts of hostility, are scrupulously protected from violence or outrage.

In the seventeenth and early half of the eighteenth centuries, however, the customs were very different. The more stubborn and prolonged the defence, the greater apparently grew the exasperation of the besiegers, and the harsher the terms accorded to the vanquished. If the operation was terminated by a successful assault on the main works, the sack and plunder of the town, accompanied by the murder and outrage of large numbers of helpless civilians, invariably followed. This was due rather to the fact that the state of discipline in the armies of those times was such as to make it impossible to recover control of the troops in the flush of a successful assault, than to any approval on the part of the higher commanders of this barbarous practice. It was natural

therefore that the defending commander should endeavour to spare the citizens of the town from such a calamity, and that when the state of the breaches had become such as to render the success of an assault probable, he should surrender on the best terms he could obtain.

There was another advantage to be obtained from a timely capitulation. It was generally customary, if the defenders yielded before all their resources were exhausted, to permit them to march out "with the honours of war," taking with them their arms, and to rejoin the main body of the forces of their State. The troops composing the garrison were thus free to fight another day. Prolonging the siege a few weeks would often be useless strategically, and would result in the whole garrison being made prisoners, and their State being thus permanently deprived of their services. The treatment of prisoners of war, moreover, was extremely rigorous; in fact, their right to have their lives spared had not very long been universally recognised.

It was considered, therefore, that the commander of a besieged fortress had done all that honour required if he had held out till the psychological moment when further resistance would be useless and would only lead to great effusion of blood and loss to the citizens, and had then capitulated on good terms. It was inevitable that among different commanders there should be a divergency of opinions as to when this psychological moment had arrived, and that those of the less resolute sort should often recognise it as soon as a breach had been formed or the attackers had made threatening movements.

At all events the general opinion, military and public, of those times was that the demands of honour, even of the more exacting kind, did not require that a fortress

should be held to the last, and the practice of surrendering without sustaining an assault was a recognised and approved one. It would not, therefore, be fair to ascribe the short duration of the defences of fortified places in those days to any defect in the methods of fortification employed, as it is evident that other causes had more to do with it.

It is impossible, however, not to notice how little effect on the result of sieges was produced by the existence of the most complete and elaborate fortification works. The fortresses possessing these by no means always made the best defences, in fact in many cases made most inadequate resistances, while others where the permanent works were of no great strength fulfilled to the utmost what was required of them. From an examination of the accounts of these operations we are led to the conclusion that the ability and resolution of the commander, the organisation of the various services, the energy and intrepidity shown in the conduct of the defence, the state of the supplies and ammunition, all exercise a vastly greater influence on the result than the actual form or elaboration of the works.

The defence of Turin is the most notable example of this. It is true that in this case the prolonged resistance was largely due to the fact that the communications remained open till a late period, but the conduct of the defence itself also contained many remarkable elements, which evidently contributed very largely to the success achieved. The original works were by no means of the imposing and elaborate nature of those designed by, or after the method of, Vauban, but they were largely supplemented by earthworks constructed at the last moment and even after the beginning of the siege. It is quite probable that this was a positive

advantage, for we read that when the attackers opened their siege batteries the defenders opposed them by throwing up new batteries and mounting guns. It is evident that such works would more nearly fulfil the tactical needs of the moment than would as a rule be possible in the case of permanent works constructed in peace time. It will be shown later on that this principle of conformation to tactical needs is by far the most important of all those that bear on the practice of land defence.

At Turin apparently the most was made of the power thus conferred by intelligent wielding of the pick and shovel. Immense numbers of batteries and lines of trenches made their appearance on the side of the defenders, and enormous quantities of engineer materials were used in their construction. Nor was there any thought of surrender prior to assault. Confident in the expectation of relief by the army collected by Prince Eugène, the garrison sustained the most determined assaults, and retaliated with an energy and intrepidity in no way inferior to that of their assailants. The most elaborate conceptions of the brain of Vauban were of no value in comparison with methods such as these, as is strikingly shown in the poor defences made at Menin, Tournay, and other places.

It was most unfortunate, therefore, that the theoretical side of the question, the study of geometrical forms and technicalities, should in succeeding years have acquired so exaggerated an importance and received so great a share of attention as they did, for the result was to entirely obscure the infinitely more important principle of arranging the works and organising the mode of defence on a tactical basis, that is, in permitting of conformity with tactical needs.

These distorted views prevailed throughout the eighteenth century, and may be traced even down to a late date in the nineteenth, but a good deal was done to dissipate them by Napoleon, by whose orders Carnot wrote his celebrated treatise on the defence of fortified places, with a view primarily to combating the prevalent notion—a legacy of the seventeenth century—that fortresses should be surrendered without awaiting assault. Carnot also, as has already been mentioned in the preceding chapter, laid stress on the importance of active and energetic measures in the defence, and of having regard to tactical requirements generally. It was said to be due to the teachings of Carnot, that the defences made by the French garrisons of the antiquated and ill-fortified fortresses in the Peninsular War were of so resolute a nature. These operations will be described in another chapter.

CHAPTER V

SIEGES OF THE PENINSULAR WAR—TACTICAL CONDITIONS—THREE
SIEGES OF BADAJOS—CIUDAD RODRIGO—BURGOS—SAN SEBAS-
TIAN—GENERAL LESSONS OF THESE SIEGES

FROM the sieges of the Peninsular War may be drawn some valuable lessons—not so much that the operations themselves afford illustrations of any particular principles, as from the fact that an unique and most admirable account of them has been furnished by Sir John Jones in “Journals of the Sieges in Spain.” In this work is found not only a faithful and minute account of the siege operations undertaken, but a shrewd and impartial analysis of the conditions which prevailed, and of the causes of the results obtained. It is true that the operations are described from the point of view of the besieger instead of from that of the defender, but they are not of less value on that account, as it is often an assistance in forming correct conclusions to be able to see the question from both sides.

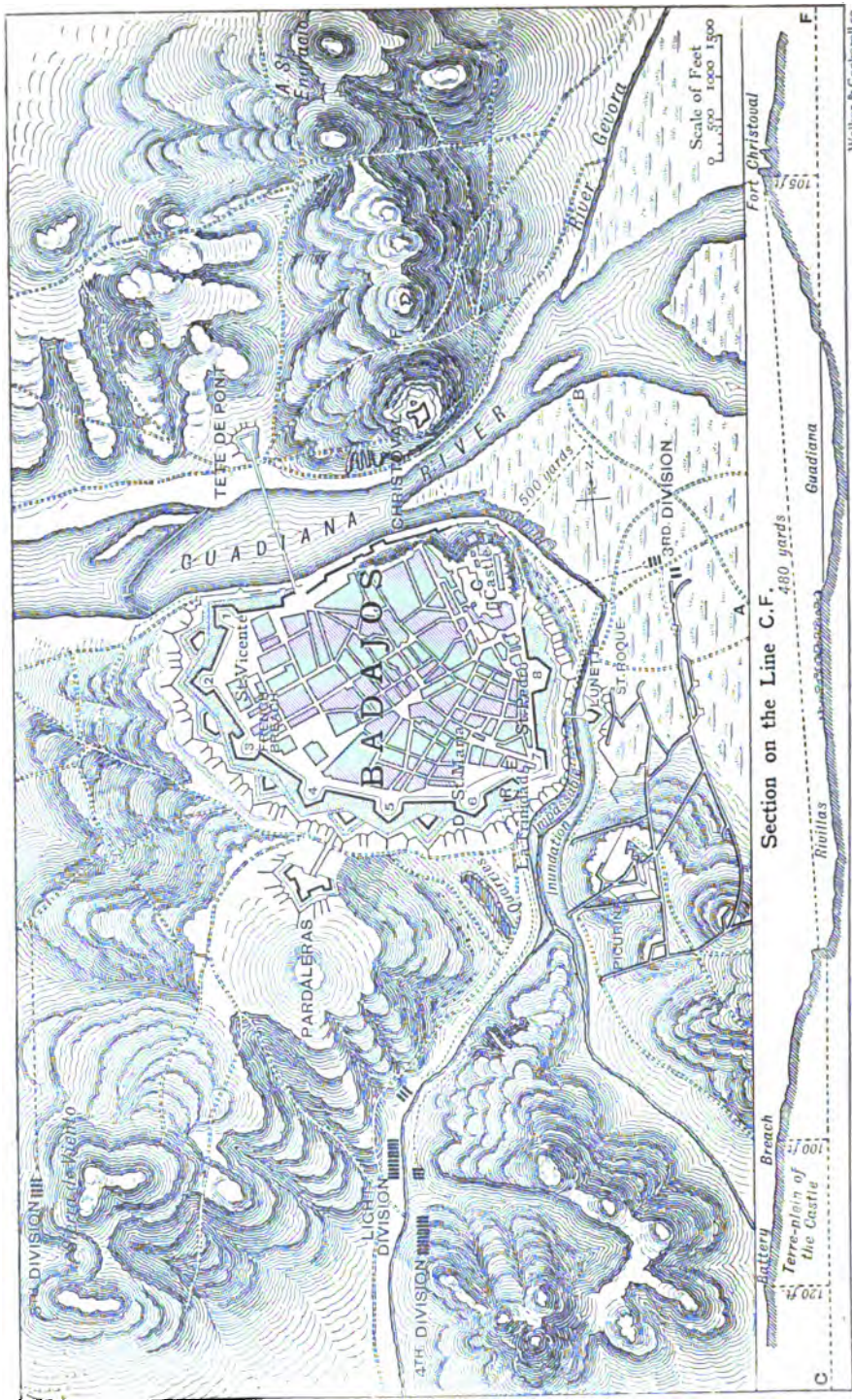
The power of the weapons in use at this time was as follows:—The musket had progressed but little in the preceding century, and its effective range was little over 200 yards. The siege guns in use at the beginning of this campaign were of brass, the largest size firing 24-lb. round shot; they were of small power, and only capable of a very slow rate of fire owing to their being liable to droop at the muzzle from firing. There were also some howitzers and mortars firing shell, but these

were inaccurate and of limited range. Pieces of this type were used by the English in the earlier sieges of the war, but iron guns having begun to come in, a number were sent out from England and used with effect in the later operations. These guns showed a considerable advance in power over the brass ones. "The artillery practice at these sieges, compared with anything we read of at prior operations, is altogether extraordinary. The fact is that iron guns had for many years past been gradually improving and obtaining a superiority over those made of brass, both as to capability of supporting severe firing and as to their accuracy in throwing shot, which was scarcely suspected till the experience of these sieges."¹

The actual range of these guns is shown in the following passage: "The experience of these sieges shows that an exposed wall may be breached with certainty at distances from 500 to 700 yards, even when elevated more than a hundred feet above the breaching battery; and it is believed that in a case of extreme necessity, it would be justifiable to attempt to batter down an exposed wall from any distance not exceeding 1000 yards; but then the quantity of artillery must be considerable, and it will require from four to seven days' firing, according to the number of guns in battery, and the period of daylight, to render a breach practicable."

At nearly all the sieges undertaken by the Duke of Wellington in Spain we find that the operations were severely hampered by the total inadequacy of the means available. England in those days suffered from her usual defective military organisation and want of preparation, and had totally neglected the provision of an

¹ All the quotations in this chapter are taken from the "Journals of the Sieges in Spain," by Sir John Jones.



engineer establishment. There was an entire lack of trained personnel; in fact, we find it "stated in plain and unequivocal language that the army in Spain was unattended by a single sapper or miner till late in 1813." There were a few R.E. officers, and these were aided by volunteers from other branches of the service. For sapping, and even for mining, men were taken from the infantry, picked men, but utterly untrained in those operations, in the execution of which they accordingly took twice as long as trained men would have done. Of materials there were practically none, and time was seldom available for the collection or manufacture of sufficient quantity. It must be remembered also that the total strength of the French forces in the Peninsula was greatly in excess of the British, so Wellington's sieges had to be pushed quickly to an issue, as any delay admitted of the French Marshals concentrating their forces and bringing greatly superior numbers to bear on the besieging army. The operations of the latter were, therefore, nearly always against time. Against these disadvantages must be set the fact that the Spanish fortresses were old and in a neglected condition, except in so far as they were improved by the French troops during their occupation, that their scarps were nearly always exposed, sometimes down to the very foot, and often of bad masonry which fell directly it was battered, and that their artillery was, as a rule, insufficient.

First Siege of Badajos.—The fortress of Badajos was besieged three times, namely in May 1811, June 1811, and March and April 1812. It was situated on the river Guadiana, which, being broad and deep, sufficiently protected the north side, the defences of which were therefore only "a simple and badly flanked rampart with an exposed

revetment." The remaining sides of the enceinte were regular bastioned fronts with escarps 30 feet high at the bastions and 23 to 26 feet high at the curtains. All the escarps seem to have been more or less visible. There were counterscarp walls and a glacis, but the ravelins were unfinished. At the north-east corner of the town was situated a castle on a hill 100 feet high. The walls of this castle, which were "naked, weak, and but partially flanked," formed at this point part of the enceinte. The terreplein of the castle sloped somewhat towards the north, and was therefore easily seen into from the heights of Christoval, situated on the opposite bank of the Guadiana and about 500 yards distant. In order to prevent these heights from being occupied by a besieger, a strong detached fort had been built on them. There were also two other detached works, the Pardaleras and Picurina, in front of the south and south-east fronts respectively of the enceinte.

When Wellington arrived before the town at the end of April 1811, he determined that the plan of attack to be adopted must be one that would not require more than sixteen days' open trenches, as he calculated that in that period, added to the time required to complete the necessary preparations for the siege, Marshal Soult would be able to collect a force equal to its relief. His ordnance consisted of the inferior brass guns and howitzers mentioned above, and not many of them; of trained engineers he had none, and of stores and materials a very inadequate supply. Deeming that under these circumstances time would not admit of bringing to a successful issue regular siege operations against the more strongly built bastioned fronts, he determined to go for the castle, which formed a weak point. His design was to begin by an attack

from the north side on Fort Christoval, which was to be breached and carried by assault. Then batteries were to be erected on those heights to bring an enfilade and plunging fire on the walls and interior of the castle, and at the same time parallels and breaching batteries were to be thrown up against the castle on the plain to the east of the latter, and on the left bank of the Guadiana. It was thought that these batteries would be able easily to breach the exposed and crumbling walls of the castle.

On the 4th May the investment was effected, and on the 9th all the available ordnance and stores having been brought up, the plan of operations was put in execution. Ground was also broken before the Pardaleras and Picurina redoubts so as to deceive the garrison as to the real point of attack. The progress of the trenches was, however, slow, owing to the rockiness of the soil and to the activity of the garrison of Christoval; moreover, the besieging artillery found itself quite unable to cope with that of the defenders. On the 13th May, news having arrived that Marshal Soult was on the march to relieve the place, preparations were commenced for a withdrawal, and on the 15th the siege, if indeed it can be called one, was completely raised.

Second Siege of Badajos.—On the 19th May the place was reinvaded, Soult's force having in the interval been completely defeated at Albuera, but it was impossible to commence the siege before the 30th, owing to the time required to repair the carriages and bring up the guns, which had been withdrawn to Elvas. It was known that in a short time Marshal Soult would again be able to unite his scattered forces and combine with Marmont so as to bring up a force much superior to the British, so it was necessary that the reduction of the place should be

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effected with rapidity. Lord Wellington determined to follow generally the plan adopted at the previous attack. He had this time a stronger force and a fair amount of engineer stores, but still very few trained sappers. His artillery was greater in numbers than before, but still of the same inferior brass type. The following is how it is described: "The ordnance employed at this siege, besides being of an excessive bad quality, was also totally inadequate in quantity to the reduction of such a fortress as Badajos, although everything Elvas could supply was drawn from that garrison. The guns, it has been stated, were of brass, false in their bore, and already worn by previous service; and the shot were of all shapes and diameters, giving a windage of from one-tenth to half-an-inch. The howitzers used as mortars were defective equally with the guns; their chambers were all of unequal size, the shells did not fit the bore, and their beds were unsteady, so that the practice was necessarily vague, and they proved of little service. The Portuguese gunners were young and inexperienced, and the number of British mixed with them far too few; both, however, evinced the greatest ardour and bravery." During the course of the siege, fourteen of the guns were disabled by drooping at the muzzle, and one gun and three howitzers became ineffective from other causes arising out of their own fire. This was in addition to those pieces, six in number, which were disabled by the enemy's fire.

Batteries and trenches were begun in front of Fort Christoval, and others were opened simultaneously against the east front of the castle. The walls of the latter, however, notwithstanding their exposure and apparent feebleness, offered an unexpected resistance. It turned out that the scarp was a perpendicular bank

of earth, only thinly faced with brick to resist the weather. The brick facing was soon demolished, but the earth bank was found difficult to injure, and the result of the battering was only to bring off vertical slices, thus still leaving a perpendicular face. Notwithstanding the inaccurate practice caused by the defective ordnance, by the 9th of June it was considered that a practicable breach had been made in the escarp of Fort Christoval, and an assault was made that night. The inadequacy of the materials available and the want of time had prevented approaches being pushed forward to the glacis, so the assaulting parties had to start from the parallel about 400 yards from the place. Protected by darkness they reached the ditch without loss, but there they found that the garrison had cleared away the débris at the foot of the breach, and that the wall was still unclimbable. The ladders which accompanied the storming party were then used in attempts to escalade, not only at the breach but at many other points in the ditch, but "the garrison showered down upon the assaulting party shells, hand-grenades, stones, &c., in overwhelming quantities for an hour, in which these impracticable attempts were persevered in"; after that the attackers withdrew, having suffered considerable loss.

The next day the bombardment of Fort Christoval was renewed, and six iron 24-pounder naval guns having been brought up, they were brought into battery against the castle, in the walls of which a practicable breach was in a few days formed. On the 9th the breach in Christoval was again reported practicable, and orders were issued for its assault during the night. On this occasion a brisk fire of grape was kept up on the breach prior to the assault to prevent the defenders from

removing the débris. The assaulting troops were in two columns, one to attempt to gain an entrance by the breach, and the other by escalade at the salient angle of the bastion. A detachment was also told off to line the crest of the glacis and keep down the fire of the defenders on the parapet.

The garrison had, however, been considerably strengthened, and were well on the alert and elated from their previous success. They received the attacking columns with a hot fire of musketry from the moment they quitted the shelter of their trenches. The latter, notwithstanding this, succeeded in getting into the ditch after suffering some loss. Here the party attacking the breach became the objects of "an immense number of shells and combustibles rolled down upon them from the parapets of the fort"; and this, added to the determined behaviour of the defenders, caused a check and prevented the breach being captured. The other party at the salient succeeded in raising their ladders, but every man who ascended was bayoneted down, and after a while the garrison, mounting the parapet, threw the ladders down. By this time both columns had got mixed up together in the ditch, and many efforts were made to raise the ladders at various points, "but the enormous quantity of large shells, hand-grenades, bags of powder, and combustibles which the garrison threw into the ditch rendered their perseverance and gallantry unavailing," and the attackers ultimately withdrew, having lost over fifty per cent. of their number killed and wounded.

The next day Lord Wellington, realising that the castle could not be assaulted till Fort Christoval had been captured, and that the latter could not be achieved without approaches being pushed forward and a lodg-

ment made on the glacis in order to completely keep down the fire of the defenders on the parapet while the assault was in progress, decided to raise the siege, as his materials were inadequate and time not available for the latter operation. Moreover, he had learnt of the concentration of Soult's and Marmont's forces for the relief of the place. The British forces therefore withdrew.

Third Siege of Badajos.—It was not till March 1812 that the reduction of Badajos was again attempted. On this occasion there was not the same urgent necessity for haste as before. The siege train was stronger, and consisted entirely of iron guns and howitzers. Engineer materials and tools had been collected for some time previously and a certain number of trained artificers were available, but no sappers, except partially instructed infantrymen. The French had, since the last siege, materially strengthened and added to the works, particularly at the castle and Fort Christoval. They had also, by blocking up the arches of one of the bridges over the Rivillas stream, formed an impassable inundation 200 yards wide, between Picurina redoubt and the enceinte, along the foot of the glacis before fronts seven and eight.

The investment was effected by the 16th March. The project on this occasion was as follows: to bombard the Picurina redoubt and carry it by assault, then to establish batteries on it and in its neighbourhood, whence it would be possible to breach the right face of the bastion Trinidad, and the left flank of the bastion Santa Maria. Also, as the garrison would be able to retrench these breaches, to form a third breach in the face of the curtain between these bastions. The curtain, being low and weakly built, could, it was

thought, be rapidly breached at the last moment so that the garrison would not have time to retrench it. The obstacle of the inundation would be avoided by the storming columns being formed behind the hills to the south and west of it.

Trenches were opened on the night of the 17th March before Picurina. The latter was a strong redoubt in the form of a bastion. The escarp of the front faces was only fourteen feet high and had a row of fraises along the top; above this was a steeply sloping earth rampart. The counterscarps were nine feet high, and the ditches of these faces were flanked by splinter-proof casemates in the salients. The gorge had no counterscarp but had a treble row of inclined palisades, and flank defence was afforded by arrangement of the trace. The flanks of the work had no flank defence. Batteries were constructed in order to bombard Picurina and to enfilade all the faces and flanks of the enceinte which bore on this work; it was not, however, till the 24th that they were completed and armed. Meanwhile a spirited sortie of the garrison made from the town on the 19th had caused considerable loss. After one day's firing, which produced little effect on the defences of Picurina, it was determined to assault the latter. The assault was made on the night of the 25th and was successful, though the losses of the storming parties amounted to 50 per cent. of their numbers.

A lodgment was immediately made, and on the following days batteries were constructed in the gorge of the work and close outside its flanks for the purpose of effecting breaches in the enceinte at the points originally selected. Other batteries were made in suitable positions, and the approaches pushed forward to the edge of the inundation; a fire was also brought on the

lunette St. Roque, which protected the bridge over the Rivillas and the dam of the inundation.

By the 6th April the breaches were considered practicable for assault, and this was urgently necessary as it had become known that Marshal Soult was advancing to the relief. One division (the 4th) was told off to force the great breach in the face of the bastion La Trinidad, and to detach a force for the attack of the breach which had been made at the last moment in the curtain between La Trinidad and Santa Maria bastions. Another division (the Light Division) was to assault the breach in the flank of the Santa Maria bastion. Another division (the 3rd) was to attack the castle by escalade, and one brigade of the 5th division, who were on the Sierra del Vento to the south-west of the place, was ordered to march round the west side of the fortress and escalade the bastion of St. Vicente, which formed the west angle; at the same time a small column was ordered to capture the lunette St. Roque.

The assault was commenced at 10 P.M. on the night of the 6th April. The lunette St. Roque was speedily carried. The 3rd division, after an obstinate fight, succeeded in escalading the castle walls and establishing themselves therein. Meantime the 4th and Light Divisions marched along the left bank of the inundation towards the breaches on which they were directed. They were met by a heavy fire when on the glacis of the fortress, but succeeded in descending into the ditch. Here the garrison exploded the fougasses, shells and other combustibles which they had prepared, and their effect was most destructive. In the confusion the 4th division mistook the way and mounted the unfinished ravelin in front of the curtain, thinking it to be the

breach. When they got to the top they were exposed to a heavy musketry fire from the whole length of the front, and saw before them a difficult descent into the ditch again, so a check ensued. At the same time the Light Division also went astray and mounted the same unfinished ravelin from the left side; then they became mixed up with the 4th division on it, thus adding to the confusion. Repeated attempts were made to restore order and to lead the troops to the attack of the breaches. The latter, however, had been strengthened by various devices. The great breach in La Trinidad had been covered all over its slope with harrows, and its top had been closed with a *cheval-de-frise* of sharp sword-blades. This breach had also been retrenched. The breach in the flank of Santa Maria had also been provided with a *cheval-de-frise* of sword-blades. Several parties of determined men attained to the tops of the breaches and endeavoured to remove the *chevaux-de-frise*, but were all bayoneted or driven down the slope again. The garrison behaved with the utmost coolness and intrepidity, repelling assailants with the bayonet, keeping up a hot fire upon the crowded ranks in the ditches, and rolling down immense numbers of shells and fire barrels. The slaughter was appalling, and after many desperate but ineffectual efforts the attackers could not be prevailed on to attempt any more, though they did not retire.

The 3rd division, who had taken the castle, were unable to come down on the flank of the defenders of the breaches as the gates between the castle and the town had been barricaded by the garrison. Meanwhile, however, the brigade told off for the bastion St. Vicente arrived there, and, though discovered while on the glacis, succeeded in forcing their way in by the

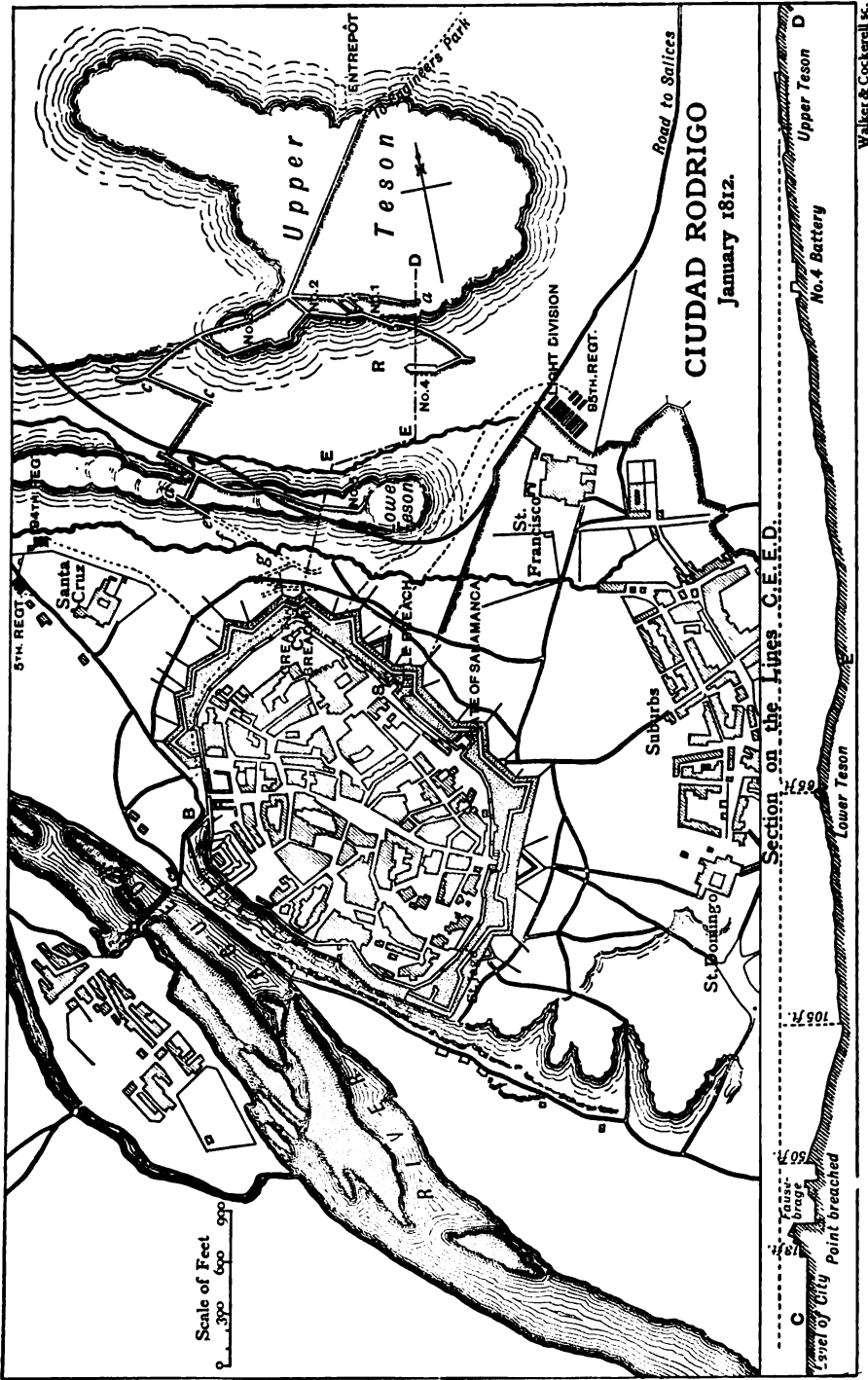
escalade. After they had got in they were very nearly routed by a counter-attack, but repulsing this they advanced to the breaches in La Trinidad and Santa Maria, taking them in reverse, whereupon the garrison fled. The Fourth and Light Divisions then marched in through the breaches and the place fell. Thus ended successfully, but at great cost, the third of the series of sieges undertaken by Lord Wellington against this strong fortress. The losses on the night of the assault alone were 59 officers and 744 men killed, and 258 officers and 2600 men wounded. It is instructive to note the fact that the attacks on the three good practicable breaches, one at least of which (that in the curtain) "was particularly low and easy of ascent" and was not retrenched, resulted in complete discomfiture, while the escalades of other points where there were no breaches were attended by success.

Ciudad Rodrigo, 1812.—The fortress of Ciudad Rodrigo was besieged in January 1812. The works consisted of a double enceinte all round the town, the inner one being an old and weak wall, thirty-two feet high and unflanked, while the outer one was a *fausse-braie* of low profile, flanked by bastions and provided on some of the faces with ravelins. The *fausse-braie* was built so far down the slope of the hill that it afforded very little cover to the inner wall, and for a similar reason it was itself very imperfectly sheltered by its own glacis. Some 300 yards east of the town were the suburbs, which were surrounded by a weak entrenchment, but strengthened by three strongly fortified convents. North of the town and about 180 yards from the enceinte was a small hill called the Lower Teson, and some 400 yards further off was another and larger one called the Upper Teson. The latter commanded the main ramparts and

a small redoubt had been constructed on the nearer edge of it.

Lord Wellington's means at this siege were much superior to what they had been at the two first sieges of Badajos, which had preceded it. His siege train was fairly numerous, and consisted entirely of iron pieces, including some powerful howitzers and mortars. A large quantity of engineer materials had been collected, and a number of picked men from the infantry had been specially trained during the past summer in sapping and mining. The siege was, therefore, conducted in a more scientific and systematic manner than had been possible on the previous occasion.

The attack was made on the northern fronts. On the 8th January the place was invested, and the same evening the redoubt on the Upper Teson, which was of weak profile, was carried by assault, and a parallel and approaches formed the next day. Batteries were then constructed in the vicinity for breaching the enceinte. About the 14th approaches were pushed forward and a second parallel opened along the line of the Lower Teson hill, 180 yards from the place. A battery was also commenced here and completed on the 18th. By the night of the 19th two practicable breaches had been formed; one, known as the "great breach," was through both the *fausse-braie* and main scarp wall at the most salient point of the northern side of the fortress. The other, called the "little breach," was in a small projecting tower over the *fausse-braie*, about 130 yards east of the "great breach." The little breach had not been retrenched at all, as it had only been formed in the last day or two, but the great breach had been strengthened in a rather ingenious manner. A little way in rear of the parapet and parallel



Scale of Feet
 0 300 600 900

CIUDAD RODRIGO
 January 1812.

Section on the Lines C.E.E.D.

C
 Level of City
 Causeway bridge
 Point breached

105 ft.

105 ft.

105 ft.

105 ft.

105 ft.

105 ft.

Lower Teson

No. 4 Battery

Upper Teson

Walker & Cocherell sc.

Road to Salices

RIGHT DIVISION
 8TH REGT.

St. Francisco

St. Peter

St. Domingo

Suburbs

St. Peter

St. Domingo

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to it was a vertical revetment wall sixteen feet deep, which was the retaining wall of the ramparts; at the foot of this wall was the level of the town. Two cuts were made in the parapet at the sides of the breach, so that the assailants having mounted the breach would be under a close enfilade fire from the cuts, and would be confronted with the alternative of forcing the cuts at the point of the bayonet or jumping down a sixteen-foot wall, the bottom of which had been strewn with crows' feet, *chevaux-de-frise* and vertical iron spikes, and a large supply of burning combustibles.

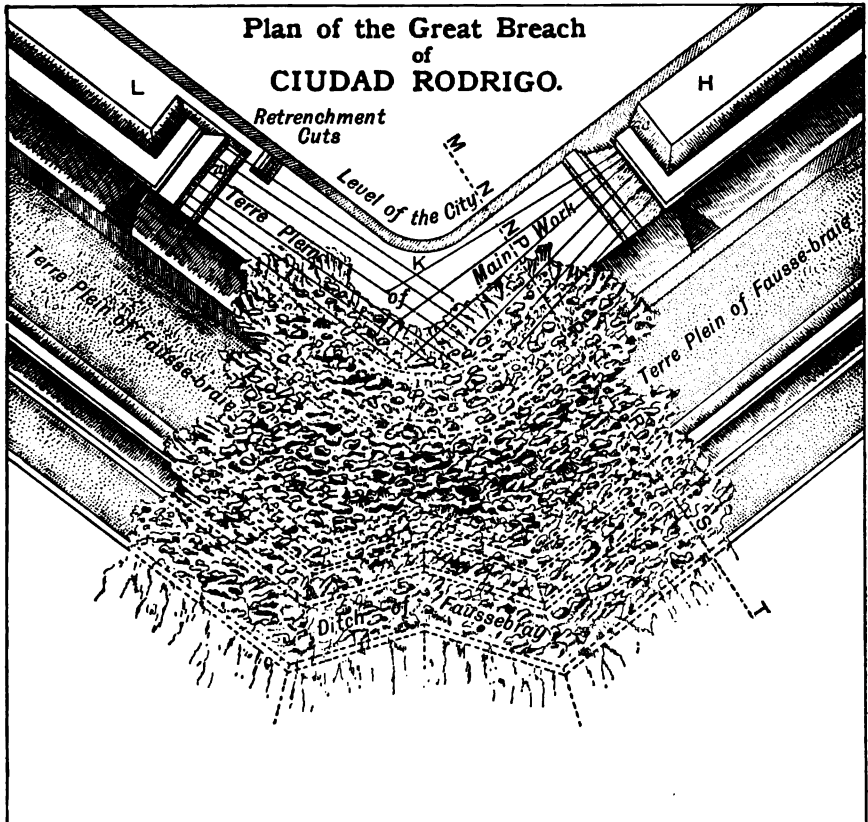
The assault was delivered at 7 P.M., covered by a heavy fire of musketry from the trenches in order to keep the defenders of the parapets down. The columns were preceded by sappers carrying bags of hay, which they threw into the ditch for the men to jump on to. The garrison had prepared a large number of combustibles in the ditch, but they fired them too soon and they had burnt themselves out before the stormers arrived. The main breach was mounted in a gallant manner, and a fierce bayonet contest ensued. The defenders retired behind their retrenchment cuts, which they obstinately defended. Meanwhile the other column, without difficulty, carried the little breach "which was not obstinately disputed," and having arrived at the top moved to the right in order to take in rear the defenders of the great breach. The latter then dispersed and the place fell. The losses in the assault were about 700 officers and men killed and wounded.

Burgos, 1812.—The Castle of Burgos was besieged in September and October 1812. It was situated on a commanding hill with steep sides. The defences were a triple line of enceinte, the outer one the old

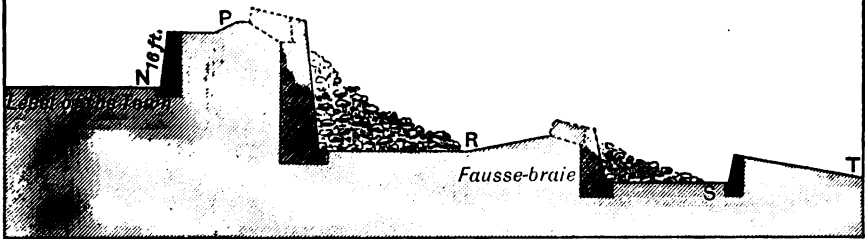
wall of the town or castle, modernised with a shot-proof parapet, and flanks ingeniously provided by means of palisades, or tambours, at the salient and re-entering angles. The second and third lines were of field profile each above the other. Above all on the highest point of the hill was a keep, containing a strong casemated battery. There was another hill known as St. Michael, some 300 yards from the enceinte and separated from it by a deep ravine, with its summit at the same level as the upper works. On this hill was a large hornwork, the front of which was on a bastioned trace, but the gorge had been only temporarily closed by a palisading. The fortress, which was held by a garrison of between 2000 and 3000 men, is described as "very insignificant" if opposed to the efforts of a good army.

On the British side, however, means for prosecuting a siege were totally wanting. The only artillery available was three 18-pounder guns and five 24-pounder iron howitzers, both of which were very ineffective weapons, in fact the latter are reported to have done "little more than waste invaluable ammunition." There were hardly any engineer materials, few tools, and as for technical troops "not even a half-instructed miner, or half-instructed sapper—barely an artificer."

The side selected for attack was the south-west, because the lines there were weakest and the hillside was so steep that the guns mounted in the works could not be depressed sufficiently to see down it. It was, however, necessary to first capture the hornwork St. Michael, which was accordingly assaulted on the night of the 19th September. The assault was delivered in three columns, two for the escalade of the right and left bastions respectively on the front face, while the third moved round the work to effect an entrance by the



Section on the Line M.T.



Walker & Cockerell sc.

gorge. The frontal columns were supported by a firing party, who were supposed to establish themselves on the glacis to keep down the fire of the defenders, but directly these quitted the trenches such a hot fire of musketry was brought to bear on them from the parapet that they suffered great loss and finally retired. The escalade of the bastions was therefore unsuccessful. Meanwhile, however, the third column had reached the gorge, losing half its numbers from the fire of the main line of defence during the operation, and had succeeded in forcing its way in with little opposition, thus taking the work. The losses during the operation were over 400 killed and wounded.

A lodgment was made and batteries commenced, but owing to the insufficiency of means for trench work it was decided to try and carry the outer line of defence by escalade. The attempt was made on the night of the 22nd September, but was repulsed. It was then decided, it being considered hopeless to attempt to form breaches with the feeble artillery of the besiegers, to work up to the place by trenches and mine under the wall and blow it down. When excavating the approaches down the slope of the hill turned towards the enemy, great difficulty was experienced in getting cover, and the losses were consequently heavy, but when the advance of the trench was up the slope of the hill on which the castle stands the reverse was the case, and the occupiers of the trench were easily sheltered, though the garrison threw numbers of hand-grenades into it. The advance of the mine gallery was slow, as the miners were untrained infantrymen, armed only with the ordinary pickaxe. By the 29th, however, a charge of 1080 lbs. of powder had been placed behind the wall. A storming party was held in readiness in the advanced trench to rush the breach

as soon as the mine was sprung. Directly the explosion took place a sergeant and four men who were in advance mounted the breach and found the defenders so panic-struck as to offer no resistance, but the main body of the stormers lost their way in the darkness and struck a part of the wall too much to the right; finding the masonry here uninjured, they retired and reported that the explosion had produced no effect. The opportunity was therefore lost, and by morning the defenders had formed a parapet in rear of the breach and planted obstacles on the ascent.

The attackers at once commenced another mine gallery and endeavoured to make batteries close to the wall (one only sixty-five yards off) for breaching purposes, but the plunging fire brought to bear on the latter, prevented the guns being served and disabled several pieces. On the 4th October, at 5 P.M., the second mine was sprung, and a storming column immediately dashed into the breach, while another attacked the breach which had been made by the first mine on the 29th September. Both attacks were successful, and during the night lodgments were made at the summits of the breaches.

Another laborious advance by sap and mine was then made to the second line, and an attempt was made to form a breach in it from the batteries in rear of St. Michael. The defenders made several sorties which caused severe losses to the besiegers. On the 18th October, two breaches having been made, it was decided to storm them and also to explode a mine under the wall of the Church of St. Ronan, which stood just outside the second line of defence on the opposite side of the fortress, with a view to making a lodgment there. The stormers carried the breach, but were immediately driven out again by greatly superior numbers. The mine under

the church did not do much damage, but the garrison abandoned it, firing the mines previously prepared by themselves, which reduced the church to ruins. The attackers then lodged themselves in the ruins, but could not penetrate the second line. The attack on the second line had therefore failed.

By this time several of the besiegers' scanty pieces of ordnance had been disabled, small-arm ammunition had run short, artillery ammunition had altogether given out, in fact for some time they had been reduced to collecting and firing the enemy's shells; the spirits of the attackers were depressed by constant failure, while the defenders had been rendered confident and bold by success. Lastly it was found that the French forces were moving to the relief of the place, so the siege was raised. It had lasted thirty-four days.

San Sebastian, 1813.—The fortress of San Sebastian was besieged in 1813. Though the main line consisted of a strong bastioned trace, the face attacked was an ordinary masonry wall flanked by round towers. The besiegers had good ordnance and ample stores. A breach was made without much difficulty in the wall, and on the 25th July was carried by assault, but a vigorous counterstroke drove back the assailants with heavy loss. A second bombardment was undertaken in August, and the same breach was assaulted on the 31st of that month. This time the breach was retrenched and desperate fighting took place; but a heavy fire being brought to bear from distant batteries on to the parapet and retrenchment, the affair ended in success for the attack, though at a loss of about 2000. The garrison, except about 700 who were taken prisoners, retired into the castle and convent of St. Teresa, which formed a keep, and held out there for eight days longer.

The design and execution of the lines of Torres Vedras and the organisation of the measures for their defence were of so unique a nature and afford so many valuable lessons that they deserve detailed treatment in a separate chapter.

The present, however, is a good opportunity to discuss the lessons to be learned from the group of sieges just described. It is unnecessary to advert to the obvious administrative lessons, such as the necessity for a powerful armament, and for a sufficiency of well-trained technical troops and special stores for the successful conduct of a siege. It would be instructive, however, to inquire to what extent the defences fulfilled the prime conditions stated in Chapter III. to be essential to such works, namely, as regards scope for the effective use of the defenders' weapons and restricting those of the attackers; also what were the facilities for tactical control and concentration on the points of attack. We see that in many of the cases the defences were of a primitive and rude kind, consisting of simple masonry walls; that even in the more powerful works the escarps were always greatly exposed and could with ease be battered down, even by the feeble brass ordnance used in the earlier sieges. We also find cases of siege batteries being placed on the prolongation of faces of the works and bringing a destructive enfilade fire to bear. It is evident therefore that the effective use of the attackers' weapons was not restricted. On the other hand, it would appear that good scope was afforded by the works for the use of the defenders' weapons. We read in several places of the destructive effect of the defenders' artillery fire upon the trenches and batteries of the besiegers. Though flank defence was often very inadequately provided for, yet this very want probably gave increased facilities for

frontal fire, as every elaboration or outworks necessarily takes away from the latter. Notwithstanding this lack of flank defence the assaults were obstinately and often successfully resisted, and this resistance was generally frontal rather than from flanking lines, consisting of musketry fire from the parapet and grenades, shells, fire-barrels, &c. The placing of obstacles was also in accordance with this principle, as tending to delay the attackers under fire.

It may be noted that all the assaults were made at night; this, of course, was on account of the scarcity of means and want of time preventing trench approaches being made up to the ditch, so the protection of darkness was required during the advance of two or three hundred yards from the trenches. Another reason—and this accounts for the hour of the assault being always early in the night, and not, as we might have expected, just before dawn—was that, in the event of success, some hours of darkness were required to form a lodgment on the ground won. The disadvantages of this arrangement are obvious; on several occasions the assaults failed through the columns losing their way; and the confusion and consequent loss before the breaches at the third siege of Badajos, and on other occasions, were clearly traceable to this cause. This point is worth noting, as erroneous ideas are sometimes put forward, even at the present day, in relation to the feasibility of night attacks. If in the Peninsula it was found difficult for columns in close formation to advance at night but 300 yards over open ground, generally straight to their front, the chances of mistakes are enormously increased when, as in the present day, such attacks would be from a far greater distance, over all sorts of ground; and the consequences of such

mistakes, with the weapons of the present time, are infinitely more disastrous.

The want of a permanent or second line of defence was often a source of weakness in the Peninsular fortresses, as when the first line was pierced at any point, the assailants could immediately move on the rear of the other parts of the line. This was shown at Badajoz and Ciudad Rodrigo. But at Burgos, where the defences were in three distinct lines, the second one successfully held out after the capture of the first, and saved the fortress.

Of tactical handling of the troops of the defence we see but little trace; the guns appear to have been in fixed positions, for we do not hear of any considerable movements of them in order to concentrate on the fronts attacked. It is true that when the point of assault was unmistakably indicated by the formation of breaches, troops were concentrated behind it, obstacles laid, missiles collected, and some form of retrenchment attempted; but the result often was that the attention of the defenders was so engrossed in resisting the main assault, that the subsidiary attacks or feints were insufficiently opposed, and thus became successful.

The attackers in many cases made insufficient use of fire for the purpose of keeping down the defenders on the parapets, while the storming columns were ascending the breaches, or escalading the walls, or else such fire appears to have been ineffective. In fact, the besiegers' fire, both of artillery and musketry, does not seem to have made much impression upon the defending troops, though effective against the works.

Broadly speaking, it is probable that the most striking lesson of the Peninsular sieges is the ease with

which accessible breaches could be defended, even without much help from flank defence, against the most determined assaults, and this is a lesson which, as will be seen later, is not without a bearing on the very different conditions of the present day. It also shows a remarkable change since the time of the sieges which were dealt with in the last chapter, namely, those of the wars of Marlborough and Eugène, when it was considered that successful resistance to assault could hardly be hoped for, and surrender before assault was the prevailing custom. This change was partly due to the influence of Napoleon, who had in many decrees and regulations issued the most stringent orders that fortresses were on no account to be surrendered, and by whose directions Carnot in his *Défense des Places Fortes*, a work which was in the possession of nearly every French officer of those days, had specially combated the old notions on this point, and inculcated the necessity of holding out against assaults.

But the change was also partly due to changes in weapons and tactics, and may be regarded as the beginning, though in a faint and scarcely recognisable shape, of the development of the predominating power of the defence, which from this date onwards may be clearly traced through the nineteenth century, till it forced itself into recognition at Plevna, and received a further endorsement at Colenso.

CHAPTER VI

LINES OF TORRES VEDRAS—VALUABLE LESSONS ON THE RELATION BETWEEN DEFENSIVE WORKS AND TACTICAL REQUIREMENTS

AMONG all the achievements of the Duke of Wellington, there is probably none which illustrates in so marked a degree his sound military judgment and originality as do the conception and organisation of the lines of Torres Vedras. Previous to that time, the general idea was that the only form of works capable of giving absolute security to a defensive force was a continuous enceinte on some geometrical system, and that, should it become necessary for an army to fight a defensive battle without such aids, it must inevitably be beaten. It was considered that, on the part of the defenders, "no skill in occupying and strengthening, nor firmness in disputing and maintaining ground, could balance the advantage of free and concentrated movement, and the moral confidence arising from being the assailant."¹ The defences of the Torres Vedras lines overthrew all these ideas.

The disposition of the various works and the organisation of the defence of the position in general afford so many valuable lessons that they well repay careful study; many of the lessons, moreover, are extremely applicable to the conditions of the present day. The "Journals of the Sieges in Spain" contain not only a detailed description of the dispositions and

¹ Sir John Jones, "Journals of the Sieges in Spain."

of the organisations for defence, but also carefully reasoned observations and deductions thereon. No apology is needed for quoting freely from the above-named work, as it is considered that no criticisms of the present writer could have a value comparable with those of the able author of the "Journals."

The operations which culminated in the battle of Talavera foreshadowed the necessity for a defensive campaign within the confines of Portugal, and more particularly for the protection of Lisbon. It was therefore "decided to seek out some position in the lower part of Estremadura, not liable to be turned or passed, and having an assured communication with the sea, which should command all the approaches to Lisbon, and which position, being retrenched in the strongest manner, would offer a point of concentration for the whole of the defensive forces of Portugal, army, militia, irregulars, &c., where they might, in conjunction with the British, be victualled and supplied with ammunition for any period of time, whilst occupying a most favourable field for deciding the fate of the capital and the kingdom in a general action." Lord Wellington therefore proceeded to arrange for a defensible position which would fulfil these objects, and would also protect the embarkation of the British army, should such a proceeding become necessary on account of a serious reverse.

Lisbon, as is well known, is situated on the right bank of the Tagus, and this part of Portugal forms a peninsula, from 20 to 30 miles wide, between the sea and the above-named river. It was decided by Lord Wellington to defend the place by means of a chain of fortified posts north-east of Lisbon right across this peninsula, and further to protect, by means of small works near the shore, the actual point of embarkation

of the troops near Fort St. Julien. Lastly, it was arranged to defend the city of Lisbon itself against a *coup-de-main*, by means of barriers and fortified posts, and by strengthening the castle, and mounting some guns.

The first steps were taken in the autumn of 1809 to prepare the defences of St. Julien, and to construct re-trenched posts at Castanheira, Monte Agraça, and Torres Vedras, "to support the manœuvres of the army while retiring on the meditated line, or place of embarkation." In February 1810, it had become evident that the French were making serious preparations for the invasion in force of Portugal, so Lord Wellington, after examination of the country, selected the main line of defence, and gave orders for the necessary works to be commenced.

Only four metalled roads gave approach to Lisbon from the interior of Portugal, and of these three crossed a mountain range by very difficult passes at nearly parallel points, at Mafra, Montachique, and Bucellas respectively; the fourth traversed the easier ground on the right bank of the Tagus, but passed under a strong range of heights at Alhandra, about two leagues in advance of the right of the above-mentioned line of passes. The country between the roads was very hilly and broken, so that it could not, without great delay and difficulty, be crossed at any part by an army with its artillery. It was decided to block the passes by formidable works, and to strengthen the ranges of heights between these and from the outer passes to the river and sea, by field defences, scarping, &c., so as to form a connected barrier across the peninsula, which an invader must force by a frontal attack before he could reach Lisbon, which stood about 12 miles in rear. The isolated

chain of hills at Alhandra, in front of the right flank, was also defended by several strong redoubts.

It will be seen that the position thus formed was by nature an extremely strong one; both the flanks were rendered absolutely secure by the river Tagus and the sea respectively, while the latter feature in rear afforded complete facilities for the arrival of reinforcements and supplies. The works in this line, the general nature of which will be described later, covered a front of 22 miles, and comprised 59 redoubts, mounting 232 pieces of artillery, and requiring 17,000 men for their garrison. The artillery consisted of 12-pounder, 9-pounder, and 6-pounder guns, with a few 5½-inch field howitzers in the larger works. The works which had already been thrown up, as mentioned previously, on the heights of Torres Vedras and Monte Agraça, "served as valuable outposts to this defensive line, from 6 to 9 miles in its front, blocking up the principal approaches, and assuring the troops time to take up their ground, and occupy the new defences before they could be attacked in force." These works, being more isolated, were made larger and stronger than the others, particularly those at Torres Vedras, which blocked up the most direct road of advance for the invaders; the latter were of a trace which admitted of a certain amount of flank defence, and required a considerable garrison and armament.

The execution of the works above named was pushed forward throughout the earlier half of 1810, but about July, the French having undertaken the siege of Almeida, an expectation was entertained of further delay occurring before the invasion took place. Orders were therefore given to strengthen, as far as possible, the right flank of the advanced line between Monte Agraça and the Tagus, and the left flank of the same between Torres Vedras

and the sea. The former was done by making musketry trenches from the mountain of Alhandra down to the Tagus; by cutting along the face of the mountain, near its summit, an almost perpendicular scarp, from 15 to 18 feet in depth, every part of which was closely flanked by musketry fire, and generally by artillery fire also; by erecting a chain of redoubts along the range to the left above Calhandrix, and by blocking up the valley of Calhandrix by abattis flanked from the works on the heights. On the left, from Torres Vedras to the sea, a chain of redoubts was thrown up along the left bank of the Zizandra River, and obstructions were made in this stream by which a great portion of the valley was rendered marshy and impassable. At the same time a road of communication for cavalry and artillery was made along the interior of defence from Alhandra to Monte Agraça, and all unnecessary access from the front to this post blocked up, and several bridges destroyed.

At the end of August Almeida fell, and the British-Portuguese forces began to fall slowly back on the prepared position. The greatest energy was displayed in completing the defences, perfecting the communications, and carrying out various services, such as levelling obstructions to the fire of the works, felling trees, and forming abattis, breaking up roads, destroying bridges, preparing and charging mines, &c. The irregular troops were assembled and distributed to the different works, and depots of provisions, tents, and stores formed at selected points. "The position and working of the signal stations were also perfected; and a party of seamen, supplied by the navy, now passed and received intelligence from one extremity to the other in seven minutes, with undeviating accuracy."

The allied army, about 50,000 strong, consisting of

approximately equal numbers of British and Portuguese, entered the defended territory on the 8th October. As they were in no way pressed, the question arose as to the disposal of the works of the advanced line—Torres Vedras, Monte Agraça, &c. They were too far from the main line to be held in strength without isolating and sacrificing a number of troops without sufficient object, and it was undesirable to abandon them without a blow. The whole of this advanced chain of hills formed a defensive position of considerable natural strength, possessing advantages which will be mentioned later. The portions of it towards the flanks had already been made very strong in the manner described previously. From the valley of Calhandrix to the strong position at Monte Agraça the hills were bold and precipitous, and capable of easy defence by reason of their formation. They therefore required but little artificial defences, besides the three or four redoubts previously established on the flanking points of the outer ridge, but lateral communications were provided, and bridges and roads from the front destroyed. The only portion, therefore, of the advanced line which was without artificial defence was the space between the Torres Vedras position and Monte Agraça, a length of seven miles. The observations by the author of the "Journals" on this portion contain so excellent an illustration of the essential requirements of a defensive position as to merit quoting *in extenso*.

"In appreciating this distance of seven miles, it should be recollected that *the number of men required to guard a position depends less on the extent of its front than on the facility of access to the several portions of it.*¹ Large

¹ The italics are by the present writer. This sentence contains the very pith of defensive tactics.

armies with their numerous trains of artillery cannot engage across a country, particularly when the defensive force is strongly posted or retrenched; but their principal columns of attack must march by the great roads or open spaces. To ensure a victory over good troops it is not sufficient to push up to their position bodies of light and unsupported troops, or even strong columns with bayonets only, as Marshal Massena did at Busaco; but a superiority of force of all arms must be brought to bear conjointly on the point destined to be overwhelmed. Being so, it is evident that the nature and number of the lateral communications within, and of the direct and lateral communications without a position, are main points on which the force necessary for its occupation depend. In front of the range of heights extending from Monte Agraça to Torres Vedras the only exterior road parallel to its front (that of Runa) was blocked to an offensive force till after the capture of several strong redoubts; and only two direct roads, and those little distant from each other, lead over the range. This ground consequently possessed defensive capabilities which far more than counterbalanced its extent of front."

The advanced line had also a peculiarity of feature which added in a marked degree to its defensive capabilities. The lofty and precipitous mountain range of Monte Junto projects out from the centre of the line, and nearly at right angles to its front, for a distance of fifteen miles. This range was impassable for an army with artillery. Even the little Serra de Barregudo, which connects the southern end of Monte Junto with the Torres Vedras position, could not be crossed by artillery without a publicity and delay, which would have deprived the movement of every advantage; and

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the road through Runa, which forms the only lateral communication, had been blocked. The attackers' means of communication, therefore, from one flank to another of the position was only by a very long and tedious detour. The existence of this range therefore resulted in dividing the area of the attack into two parts, and would force the invaders either to concentrate their attack upon one half of the defensive line, or to advance in two separate bodies without communication with each other. On the defenders' side, however, the central position and good communications permitted of reinforcements being rapidly sent to whichever flank required them, and their inferiority in numbers was balanced by superiority of movement.

Lord Wellington therefore decided to hold the advanced line, and distributed his troops along it, the main body being on the hills in rear of Ribaldeira. Immediate steps were also taken to strengthen the chains of hills from Monte Agraça to Torres Vedras by redoubts, scarps, obstacles, &c.

On the 13th October Marshal Massena's infantry occupied Sobral, in front of Monte Agraça, and pushed their outposts into contact with those of the defenders. The French main body bivouacked in the tract of country between Sobral and the Tagus. Meanwhile the British were unceasingly employed in perfecting the defences of the heights behind Runa and Ribaldeira. Strong redoubts were made on commanding points, valleys blocked by abattis, flanking batteries and communications formed, until in a short time this part of the line was as strong as the rest. In other places also the defences were added to, and every preparation made for the attack, which was believed to be imminent.

“Every morning, two hours before daybreak, the

troops stood to their arms at the point of assembly of their several cantonments, as did also the garrisons of the works; Lord Wellington, in person, being in the fort at Monte Agraça, in readiness to direct any general movement. The army thus remained under arms until a communication from every portion of the line, and ocular demonstration had assured their commander that no change had taken place in the disposition of the hostile troops, nor any preparations been made for immediate attack; the several divisions and brigades were then ordered to resume their daily labours of strengthening their respective fronts, making lateral communications, improving the roads, sheltering and securing their outposts."

Marshal Massena closely examined the lines in person, and the more he looked at them the less he liked them. He soon recognised the futility of attacking an army so posted and supported, and confined his attentions to subsisting his forces until he could be reinforced. But the country in front of the lines had with prudent foresight been laid waste by the British and cleared of all means of subsistence, so Massena was only able to keep his forces in his bivouacs there till the 14th November, when he retired, closely followed the next day by Wellington, and took up a defensive position behind the Rio Maior. The Allies posted themselves opposite to the French, the hostile outposts being in contact at the right flank of the position at Santa Rem. The utmost vigilance was maintained on both sides. Throughout the winter affairs remained in this condition, but during this time unremitting care and attention was paid to strengthen the defences of the Torres Vedras lines, add to the scarps, and perfect the lateral communications. "The bridges on the great road from the

rear of the cantonments of the army to the front of the lines were mined for destruction, those on the lateral communications destroyed, and all obstructions to the fire of gunboats on the road or ground bordering the Tagus were levelled." But Massena did not venture on any attempt against the lines. "The invaders, after remaining in their cantonments till the commencement of March, retired out of the country, closely pursued and harassed by the Allies, offering the first and only instance of a military enterprise planned and matured by Napoleon, whilst in the plenitude of his power, being defeated by the steady perseverance and superior foresight of an opponent."

History records no finer example of successful defensive action. Both from a strategical and from a tactical point of view the defences completely fulfilled the part required of them. Tactically, though never attacked, their strength was so great that one of the ablest of the French marshals, with a well-trained and victorious army, greatly superior in numbers to that of the defenders, did not dare to attack them, and his wisdom in so abstaining has never been called in question. Strategically they succeeded in saving Lisbon, in giving to the weaker force of the British and Portuguese an opportunity of halting, recovering, and receiving reinforcements. They did more than this; they marked the turn of the tide of Napoleonic invasion and conquest, and the beginning of the reaction which continued and increased in strength, till at last, in 1814, it carried the armies of the European Allies in triumph into Paris, and led to the overthrow of the first French Empire.

We may now examine the nature of the works of which the famous lines were composed. The redoubts were of various sizes, the smallest holding 50 men and

2 guns, and the largest 500 men and 6 guns; "the importance of the object to be attained being the only guide in forming the dimensions." Some of the earlier redoubts were on a star trace, with the idea of obtaining flank defence; but this form was soon given up, "it being found to cut up the interior space, and to be most fallacious with respect to flank defence." The following observation by Sir John Jones on the trace of redoubts is extremely instructive.

"In order to decide on the proper trace of a work, it is necessary to consider whether its object be to prevent an enemy establishing himself on the ground on which it is to be placed, or whether it be to ensure a heavy fire of artillery on some other point in its vicinity. In the first case, every consideration should be sacrificed to that of adding to its powers of self-defence by flanks or other expedients. In the second, its powers of resistance are secondary to the establishment of a powerful offensive fire, and its trace cannot be too simple. Latterly the shape of the redoubts was invariably that most fitted to the ground, or such as best parried the enfilade fire or musketry plunge of neighbouring heights, care being taken to present the front of fire deemed necessary towards the pass, or other object to be guarded; and such will generally be found the best rule of proceeding."

Sir John Jones therefore considered that large isolated works on important points should contain every possible expedient to add to their powers of resistance, including flank defence, as "the experience gained in the Peninsula shows that an unflanked work of even more than ordinary field profile, if skilfully and determinedly assaulted, will generally be carried";¹ moreover, the

¹ At the present time, nearly a century later, this argument does not hold good. We know that the frontal fire alone of modern rifles in the hands of unshaken troops is sufficient to repel any assault over open ground.

objection to breaking up the outline to procure flanks, namely, that the interior space is curtailed, does not hold in large works. When, however, such works form part of a chain of works, and have a mobile force in reserve, this is not necessary, as is shown by the following note:—

“It was understood at the moment that General Junot strongly urged Marshal Massena to permit him to advance up the mountain with a division just before the dawn of day, and make a desperate effort to carry the large work (on Monte Agraça) by assault. This was good counsel abstractedly, and the assault would probably have been crowned with success had the garrison been isolated, but there was a division of infantry bivouacked in rear of the heights, which was under arms every morning long before daybreak, and had a ready communication all round the counterscarp; they would have marched on the flank of the assailants on the first musket being fired, and have rendered the attempt abortive and highly destructive.”

Some of the larger and more important works had small enclosed posts or retrenchments within them. “These interior defences and retrenchments were intended to guard against a general panic amongst the garrison, which would necessarily be composed of indifferent troops, and also to prevent the loss of the work by the entry of the assailants at any weak or ill-defended point. Such interior lines to rally on are absolutely essential to the security of a large field work.”

“The profile of the several works varied on every face and flank according to its liability to be attacked or cannonaded.”

“The redoubts of the lines being mostly thrown up as secure emplacements for guns, and to procure an open

field for the fire of their artillery being the principal object attended to in their construction, they were mostly placed on the summit of the heights they occupied, so that each face might have a full command of the ground in its front, or of the point it was intended to protect; but in other situations, where the object of a redoubt was merely to prevent an enemy occupying a particular spot, it was, whenever practicable, constructed on an inclined plane on the reverse of the height, so that only its most salient point, or perhaps its front faces, rose over the crest of the hill." The very commanding situation of some of the works, however, was found to be prejudicial to the full effect of their artillery and musketry fire.

"The redoubts, generally speaking, were merely securities for artillery in those situations where a fire of that nature was demanded by some specific object, such as to interdict the free use of a road, delay the repair of a bridge, or sweep along the entry of a pass; and in no instance were the guns considered as defensive weapons of the works in which they were placed, except at the position on the height of Calhandrix, where three redoubts in line were made to cross their fire with each other, and mutually support a fourth redoubt in advance. All the other redoubts were perfectly independent of each other, and were made of a strength of profile to resist an assault, and placed on points where artillery could with great difficulty be brought to cannonade them."

"The artificial defences of the lines altogether present a most favourable example of the just application of the engineer's art in furtherance of, but invariably subservient to tactics, creating pivots and supports, but never a tie or restraint on field movements."



The advanced line of defence, which practicably became the main one, was some twenty-nine miles in length, and the force that held it numbered under 50,000. This great extension of the defending force was in marked contrast to the usual custom of those times, and must be admitted to be remarkable when the small ranging power of the weapons of those days is considered. It was only possible by reason of the natural advantages of the position, the inviolable flanks, the free and open communication to the rear, and the difficulty of manœuvring over the rocky hills and ravines of the country. The peculiar, and from the defensive point of view fortunate, situation of Monte Junto range, dividing the area of the attack into two parts, also contributed towards the strength of the position. Last, but not least, must be noted "the judgment with which the engineer connected the several strong features of the country into an equally defensive line. Art and labour were judiciously exerted to improve natural advantages, to strengthen and cover the weak points, to diminish the length of accessible front, to block up the approaches, *to facilitate the movements of troops within, and to cramp and confine the movements of those without* ;¹ in short, to give such powers of defence and communication to every portion of the front that the army might remain concentrated in a body, keeping only detached corps of observation on its right and left, which, from the natural and artificial strength of their positions, might repel a weak or sustain a serious attack till succoured; and that at no point should a corps engage but under the favourable circumstances of a strong front, secure flanks, facility of movement, and an open but unattackable rear."

¹ Italicised by the present writer. These and the following lines are as applicable to-day as when they were written.

“ In appreciating the defensive powers of the various portions of the line against the efforts of an invader only moderately superior to the defenders, this consideration of the defensive army being a compact and manœuvring body totally independent of the works should have great weight ; as in consequence, it would not have sufficed for the ultimate triumph of the assailants that a column should manœuvre successfully so as to fall on some weakly guarded point before the defenders could be reinforced. By such a movement the assaulting force would only have lent a flank and offered a most advantageous opportunity for the attack of an army ready to engage with it ; or even should the assailants by a rapid and powerful effort have broken through any point of the line, it would have been merely to place them between an efficient army and a city, which, though not fortified, was assuredly far beyond a *coup-de-main*.”

It has been judged best to give the above extracts verbatim from the valuable work already mentioned, as they not only give a clear and concise description of the defences, but also contain such lucid and accurate reasonings as to the object of the dispositions, that the present writer could not hope to better them by paraphrase or comment.

The defences described in this chapter, and generally known by the name of the lines of Torres Vedras, form the most brilliant example in history of thoroughly successful application of the proper principles of the defensive art. The manner in which these principles were applied is rendered very clear in the extracts above quoted, which abound in most valuable lessons as to the relation between defensive works and tactical requirements. They are, moreover, strikingly applicable to the very different conditions which prevail at the present

day. The principle of concentrating strength on important points and of providing power to support any threatened point is in these days of long-range weapons and greatly dispersed lines even more important than before. Nothing can illustrate more clearly than these operations do what are the essential and vital conditions necessary for successful defence, and how valueless are most of the rules and artifices of the old and rigid methods. The very greatest profit will be derived from an intelligent study of the operations above described, and the particular attention of the student is therefore earnestly directed to them. They are the embodiment of the fortification of the soldier as opposed to that of the draughtsman, and as an object of study are of infinitely higher value than all the theories and types of all the professors, from Vauban onwards, none of whom, moreover, can sustain for a moment a comparison in military genius with the great designer of the lines of Torres Vedras.

CHAPTER VII

SIEGE OF SEBASTOPOL

THE events of the ever-memorable siege of Sebastopol are not only of the most absorbing interest to the student of siege warfare, but are also of high value in assisting to a conception of the real essentials of successful defence. Since the last great series of campaigns, which ended at Waterloo, no striking changes in the power of weapons had been witnessed. Artillery, though it had increased in range and shell power, was still of the smooth-bore order. Only a small proportion of the small arms on either side were rifled, and the effective range of the smooth-bore musket was still only about 300 yards.

The defences of Sebastopol may be said to have grown up after the arrival of the Allies before the place. The Russians possessed within the city a dock-yard and an arsenal, which meant workshops and appliances and a large reserve of guns, ammunition, and stores. In this respect they had a considerable advantage over the Allies. Their principal advantage, however, was in the possession of a Chief Engineer of the highest order of military genius, in the person of Colonel Todleben.

When the Allied armies first appeared before the south front of Sebastopol, it was the opinion of the defenders, and is repeatedly asserted by Todleben in his book,¹ that, had an assault been delivered on the

¹ "The Defence of Sebastopol," Todleben.

city, it would have been impossible to resist it successfully. The south front was totally unprepared for defence; it extended nearly five miles, and the works consisted of a two-storeyed casemated battery, called the Malakhoff Tower, and two or three bastions, the only parts commenced of an elaborate line of defence, which had been projected years before. Between these were a few field-works of the feeblest profile, and some barricades and loopholed walls, but great gaps existed destitute of any sort of defence. One hundred and forty-five guns, all of small power, formed the armament.

The delay, however, of several days, which took place while the Allied generals were consulting as to what course to pursue, was put to the utmost use. Enormous working parties, under the skilful superintendence of Todleben, brought up heavy guns from the ships in the harbour, threw up batteries, redoubts, and intrenchments, and so increased the strength of the defences, that, had an assault been delivered on the day when the Allied generals finally came to a decision, it would undoubtedly, whether successful or not, have been accompanied by great slaughter.

The decision, however, was to subdue the fire of the guns of the place by means of a siege train. On the night of the 10th October 1854, the French broke ground on Mount Rodolph at a distance of 1050 yards from the 5th Bastion. By this time, the defences had been greatly strengthened, and no less than 216 additional heavy guns had been brought up and mounted. The principles by which Todleben was guided are best shown by a quotation from his work, and, as they afford a key to the whole of the defensive tactics, they merit most careful attention.

“ We immediately proceeded to strengthen our artillery on that part of the line which faced the French trenches, as it was evident that the enemy intended to erect batteries there. Judging from the extent of the work, about forty guns could be placed on it. On our part *measures were immediately taken to oppose a superior artillery to the enemy's batteries*, and for that purpose it was resolved to pierce embrasures in the 4th, 5th, and 6th Bastions towards the enemy's trench, while favourable positions were chosen for new batteries.”¹ Here we find clearly expressed the first principle of all tactical action, and one which is every bit as necessary to the defence as to the attack, namely, the concentration of superior force upon the threatened point.

The first bombardment of the works began at 6.30 A.M. on the 17th October. The result of Todleben's dispositions was that at 10.30 the fire of the French batteries was completely silenced; one magazine and a caisson of ammunition in one of their siege works had blown up.

Against the English, however, he was not so successful. Notwithstanding that from the day on which they had broken ground, he had taken vigorous measures to bring more artillery to bear on their works, yet he was unable to put himself on equal terms with them. The English, too, were on more commanding ground. The result was that the English guns gradually overpowered those of the defence, and, at 3 P.M., blew up a magazine in the Redan, which reduced that work to a state of complete ruin. Only two guns in it remained intact out of an armament of twenty-two with which the work was armed.

Todleben gives as the reason for this superiority of

¹ Todleben's "Defence of Sebastopol," Russell's Review.

the English artillery, that their works were far off and difficult to observe. Kinglake affirms that the engineer's work was of the best—thick parapets, and well-protected magazines, and that the Russian fire therefore did not have much effect on the earthworks. These reasons are worthy of note.

The opportunity thus afforded for an assault on the Redan was not availed of. The Russians, however, lost no time in putting things right. "It was determined that not only on the following day no traces of the bombardment should be visible, but that a more imposing force than before should appear, so as to upset, on the very first day, all the calculations of the enemy. During that night attention was especially given to the re-establishment of the 3rd Bastion (Redan), which had been nearly annihilated. The most prodigious activity was displayed on this point; guns and gun carriages were dug up, platforms were reconstructed, pieces of artillery were conveyed to the bastion and placed in position, while that portion of the bastion which had been destroyed by the explosion was cleared of the rubbish; the embrasures were traced and cleared; the ditch which had been filled up was cleaned out and powder magazines established. It is due alone to the unexampled zeal of all the troops of the garrison that the bastion was restored to its normal state in such guise that in the morning it was quite ready to reply to the English batteries. The armament of the bastion now consisted of nineteen pieces of artillery."¹

The next day, the 18th October, the English batteries again opened a fierce cannonade, but did not achieve so striking a success as the first day. The French batteries were unable to reopen till the 19th, and when

¹ Todleben.

they did so were again overpowered in a short time. The defenders did not abate their energy, but went on "adding guns to the existing batteries, and creating new ones," and began rapidly to assert a superiority over the attack.

Encouraged no doubt by this, the Russians began to organise counter-attacks on a large scale, which resulted in the battle of Balaclava, on the 25th October, and the small action known as Little Inkerman on the 26th. About this time they began the employment of rifle-pits, containing a few sharpshooters, at first for the purpose of enfilading the approaches of the French trenches; these, later on, were amplified into a more elaborate system of lodgments and counter-approaches, from which a heavy rifle fire could be directed on the besiegers' working parties. Meanwhile, the French brought up more men, and pushed on their works with vigour; they also established new batteries which opened fire on the 1st November, and soon succeeded in obtaining a decisive advantage over the No. 4 (Flagstaff) Bastion; and the following night opened their third parallel within 150 yards of the salient of the bastion. The prospect of an assault had become imminent, and owing to the impossibility of keeping sufficient troops to repel it under cover near the works, the chances of it being successful were great. The only alternative was to create a diversion, and the Russians, having received reinforcements, proceeded to do this on the 5th November by means of a great counter-attack in force on the English lines, which is known to history by the name of the battle of Inkerman.

The result of that battle, though a defeat for the Russians, was that the projected assault against No. 4 Bastion was put off, and from that time the operations

of the Allies gradually assumed a defensive character. Throughout the winter they did little more than defend themselves against the attacks of the Russians, for which purpose both the English and French took steps to fortify their positions.

Of the hardships and sufferings undergone by the Allied troops during that winter, and of the utter want of administrative organisation—at all events among the British—it is unnecessary to speak. The trials of the defenders were probably as great; they were without warm clothing or shelter; besides the immense working parties necessary, they were obliged to keep the greater part of their defensive force in the open works for fear of an assault. Cholera, dysentery, and fever raged among them. But their resolution and energy were in no way abated. New redoubts and new batteries were thrown up with the utmost vigour, the armaments of other batteries were continually strengthened, and constant sorties were delivered against the besiegers' works. Trenches and lodgments were pushed out in every direction where an enfilade fire could be brought against the besiegers' trenches. The latter resorted to mining, but the defenders replied with countermines, and an elaborate system of subterranean warfare was conducted on both sides.

With the spring of 1855 reinforcements of men and ordnance began to arrive for the Allies; new works and batteries were taken in hand with vigour, and parallels and approaches pushed forward against the defenders' lines. The latter also redoubled their activity. In front of the ruined Malakhoff Tower an important earthwork, called the Mamelon, was thrown up and heavily armed. It was against this and against the Redan (No. 3 Bastion) that the besiegers' efforts were

principally directed. Todleben's admirable tactical dispositions, and his able employment of counter approaches, combined with constant sorties, greatly harassed and delayed the besiegers' progress. At last, however, the artillery of the latter began to overpower that of the Russians, and to cause enormous losses among the defenders' reserves, who, in anticipation of an assault, had to be kept close up to the front lines of works without proper cover.

The 18th June was fixed for an assault in force by the English and French armies, and this was preceded by a severe bombardment for twenty-four hours. The points selected for attack were No. 1 and No. 2 Bastions, and the Mamelon Malakhoff with the batteries in its vicinity. All of these were to be undertaken by the French, while the Redan and its annexes and the batteries on the Peressip were the objectives of the British.

At dawn of day the assaults were delivered. The French, who were on the right, advanced with great ardour on Nos. 1 and 2 Bastions and the curtain between them, but their columns were brought up by *troups-de-loups* and other obstacles, and were subjected not only to "un violent feu mitraille et de mousqueterie"¹ from the works, but also to a flanking fire from steam vessels in Careenage Bay. Under this they hesitated, retired, re-advanced, and then finally retreated. Their columns which assaulted the Mamelon and neighbouring works fared little better. They pushed on with great resolution in spite of the hot fire, and a part succeeded in escalading the curtain between the Malakhoff and No. 2 Bastion, but were driven out by the Russians at the point of the bayonet. These too retreated in disorder. Meanwhile, a strong French column succeeded in capturing Battery

¹ Todleben.

No. 6 (Gervais), which was not strongly held and presented but little obstacle, and in penetrating to some houses behind the line of defence, where they barricaded themselves. They were, however, eventually driven out after severe fighting by the Russian reserves. All the French attacks were several times renewed but without success.

Meanwhile the English attack on the Redan had been equally disastrous. The storming columns were preceded by skirmishers and detachments carrying bags of wool. Scarcely had they quitted the trenches when "un feu violent était dirigé contre eux et ils se trouvèrent en une moment, écrasés sous une pluie de mitraille lancée par le bastion et décimés par la mousqueterie du regiment de Briansk placé sur les banquettes."¹ The scaling ladders were placed in position, and the storming columns continued to advance till they reached the abattis, which had been established in front of the counterscarp; this they endeavoured to remove while the covering troops kept up a fire on the parapets of the Redan. Some portions penetrated into the ditch and endeavoured to mount the parapet. The attempt, however, could not be persevered with on account of the deadly effect of the fire of the defenders. A second attempt was also ineffective. Other and weaker English columns also attacked the batteries of the Peressip but were likewise unsuccessful. By seven o'clock all the attacks had been repulsed.

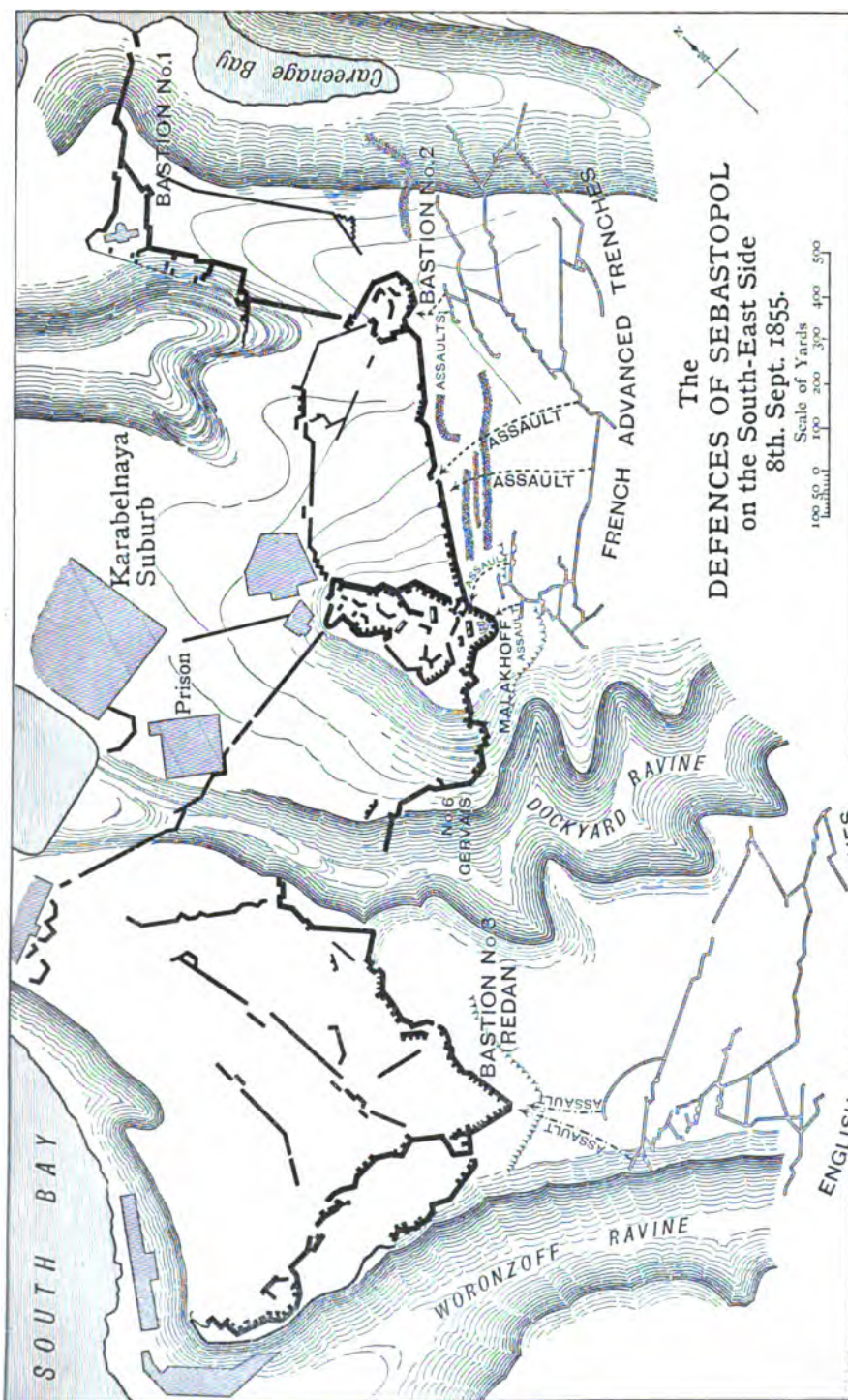
The next two months were employed by the Allies in mounting more guns and pushing forward their trenches nearer to the works. Against the Malakhoff and No. 2 Bastion in particular the most vigorous efforts were directed by the French. Nor were the defenders

¹ Todleben, *Défense de Sebastopol*.

idle. Additional batteries to sweep the approaches were thrown up, lodgments, counter-approaches, and retrenchments constructed. A desperate subterranean warfare also was carried on, globes of compression, surcharged mines, and all the resources of the miner's art being employed by both sides. But the ammunition supply of the Russians began to be insufficient to keep up the Homeric contest. Their unsuccessful attack on the allied position on the Tchernaya, and the impossibility of getting further reinforcements, began to foreshadow the end, and a bridge was constructed across the Great Bay in order to pave the way for the evacuation of the south side.

Early in September the bombardment became of an appalling character. Over 800 pieces of ordnance poured their fire upon the works, the town, and the ships in the bay, the Malakhoff Tower and No. 2 Bastion being the special objects of their attention. Incendiary shell, even barrels of powder hurled by fougasses into the works, aided in the work of destruction. The two last-named works became heaps of ruins, in which it was impossible to keep troops, and the greater part of the defenders' armament was silenced.

On the 8th September the second assault in force was delivered. Judging from previous experience the Russians expected that the assault would take place at dawn, and had great numbers of troops under arms in the vicinity of the works at that time. But the bombardment was continued throughout the morning. At 11.30 it ceased, and it was anticipated that this was for the purpose of taking rest before a further bombardment in the afternoon. But in less than half-an-hour it burst out again with renewed violence. Exactly at noon the fire stopped, and simultaneously the



The
DEFENCES OF SEBASTOPOL
on the South-East Side
8th. Sept. 1855.

Scale of Yards
100 200 300 400 500

Walker & Cockerell sc.



French columns swarmed out of the trenches and dashed at the Malakhoff and No. 2 Bastions. The Russians were taken quite by surprise, most of the men were at their dinners, or were taking shelter from the hail of projectiles; only a few sharp-shooters were at their places on the banquettes. In a few moments the French were over the parapets and among the surprised defenders, who, after a short but severe fight, were forced to fly, while the attackers took possession of all the works between and alongside those above named. But it was not long before the Russians returned; supported by strong reinforcements they impetuously attacked the French who held the works, and a series of desperate conflicts ensued. The French were driven out of Bastion No. 2 and the curtain between it and the Malakhoff. Again and again they came up to the attack and once succeeded in getting into the bastion again, but only to be driven out finally at the last. The Malakhoff, however, they held to the end against repeated Russian counter-attacks.

Meanwhile, the English assaulted No. 3 Bastion (the Redan). Though the defenders were prepared for their attack (which was delivered twenty minutes after the French one), they succeeded in capturing that work, but after a short time were driven out after a severe struggle by strong Russian reserves.

A little later the attack was renewed by the English, who again got possession of the work, only to be again driven out almost immediately. For half-an-hour the work was then bombarded by the siege batteries, after which the English once more returned to the charge, but this time without succeeding in penetrating to the interior of the work, all their efforts to do so being unavailing, and accompanied by immense loss of life.

The English also simultaneously attacked several of the batteries in the vicinity of the Redan, but, though they got into them, they did not succeed in retaining possession of any under the fierce assaults of the Russian reserves. By two o'clock all their attacks ceased.

While the above events were in progress, a strong demonstration was also made by the French against the works on the south-west side of the town itself, which at two o'clock in the afternoon was turned into an assault in force on Bastion No. 5 and its collateral works. The circumstances of the struggle here were much the same as at the other places. Some of the works were captured but immediately retaken by the Russians, and, after many attempts, the attackers finally withdrew by 4 P.M.

Altogether 55,000 men had taken part in the assaults on this day, and no less than twelve assaults in all had been undertaken. Of these only one—that on the Malakhoff—was finally successful, and this work was the only one which remained at nightfall in the attackers' hands. But it was enough. Its possession rendered the further defence of the neighbouring parts of the enceinte impossible, and during the night which followed the assaults all the works of the south side were evacuated, the defenders retiring to the north side by means of the bridge which had been constructed across the Great Bay. All the works were destroyed by explosives, the ships in the Great Bay and Careenage Bay sunk, the artillery cast into the sea, and those portions of the town which lay on the south side given over to the flames.

Thus ended the great siege, which had lasted 349 days. The extemporised defence works, hastily thrown up in the presence of the enemy and under the fire of

his guns, had achieved a success which put to shame any of the achievements of the most elaborate and costly permanent fortifications of the past. The lessons to be learned are varied and important. First and foremost is the great value of good tactical dispositions. Todleben's principle of action has already been quoted, but is worth dwelling on again. Careful observation of the enemy's works always revealed the point on which bombardment or other form of attack might be expected. Every effort was then made to mount more artillery, and throw up works on the threatened face so as to secure a preponderance. These tactics were usually successful, and the direct result of them was that for the first six months the defenders and the besiegers almost exchanged rôles—at all events the former clearly established a superiority over the latter. It was only the unlimited resources of the Western Powers, with their secure sea communication, which eventually rendered these tactics unavailing.

Another striking feature of the siege is the extremely active nature of the defence. An active defence does not necessarily include counter-attacks in force. In fact, all such operations undertaken by the Russians ended in defeat, which shows the difficulty of passing from defensive to offensive action, even in the days of smooth-bore small arms. The effects, however, even of the unsuccessful counter-attacks of Balaclava and Inkerman on the *moral* of the besiegers were considerable, as has already been shown. But by active defence in this case is meant the activity in execution of new works, in the repair of all damage done by bombardments, in the provision of obstacles, in the handling and movement of the artillery, and in the conception of rifle-pits, lodgments, and counter-approaches. Directed by

the commanding intellect of Todleben, the vigour and resolution of the defenders never slackened; throughout the long months we find them adding gun to gun, battery to battery. All the advantages claimed by the attack in the power of initiative, of surprise, of concentrated action, and freedom in movement, were neutralised by these proceedings. Approaches and parallels were pushed forward by the besiegers in the orthodox manner, which would have been certain of success against an orthodox defence. But Todleben's genius was not trammelled by any ancient theories of war. It was soon found that two parties could play the same game, and that the one with the better brains could play it to the greater advantage. From the defenders' side appeared counter-approaches and lodgments, or trenches, which enfiladed the parallels of the attack, or prevented their execution by bringing a heavy rifle fire on the working parties. Constant small sorties upon the siege trenches kept the besiegers continually on the *qui vive*, robbed them of their rest, and subjected them to loss. In fact, the latter were not far off being hustled and harassed out of their enterprise, and it is certain that the siege was enormously prolonged by these clever and energetic methods.

Of the nature of the works there is little to describe. In trace they were entirely adapted to the ground, and did not follow any particular form. Only those on the important points were closed at the gorge, those in the intervals were often mere lines of trench. The guns generally fired through embrasures, but many were mounted on barbette. The works were of field profile, and according to all the theoretical rules of those days, and even of later ones, should have been readily susceptible of capture by assault. The ground, moreover,

was very unfavourable to the execution of earthworks owing to the presence of rock below the surface, sometimes only covered by two feet of earth. Flank defence of ditches was not often attempted, but efforts were always made to get a cross or flank fire of artillery on the ground in front of the principal works—a far more important point than the ditches. To give protection to guns from enfilade fire many traverses were provided, and the drawbacks of these during the close defence against assaults is much remarked on by Todleben, who ascribes the failure to recapture the Malakhoff on the 8th September partly to this cause. Obstacles were freely employed beyond the ditches.

The effect of the besiegers' artillery upon the works is generally described as very great, but a closer examination tends to show that it was not really so. Again and again we find that after severe bombardments the works were made good again before the next morning, though it must be admitted that this was only effected by the employment of immense working parties. But the fact remains that after the most severe punishment that could be inflicted by the concentrated shell fire of all the besiegers' batteries, the works could be, and were, successfully defended. The three days' bombardment before the assaults of the 8th September, the hail of mortar and incendiary balls, had reduced the Malakhoff redoubt and No. 2 Bastion into shapeless ruins, while the other works were little less damaged. Even the element of surprise was secured for the first attack. Yet out of twelve assaults delivered that day only one was successful.

The methods relied on by the besiegers to resist assault consisted, firstly, in a concentrated fire of musketry, and of grape-shot from guns, poured on the columns

while advancing over the open, and struggling with the obstacles. For the latter purpose field-guns even were sometimes brought up at the last moment on to the parapets. Retrenchments were also provided behind the first line of works. But the most important element of all was the presence of strong reserves judiciously posted in rear of the works for the recapture of any which might fall into the hands of the enemy. Whenever the storming columns had succeeded in forcing their way into a work, and before they could recover from the inevitable confusion or regain any formation, they were almost immediately subjected to a determined attack by formed bodies of fresh troops and hurled back in disorder. As in the resistance in the earlier stages of the siege to artillery attack, so, later, in the resistance to infantry assaults, the correct tactical conception of concentration of superior force on threatened points resulted in success. But the defenders could not be strong at all points, and the Malakhoff redoubt was recognised by the assailants to be the key of the position, so after having secured it by surprise, the latter poured in great numbers of supporting troops, and put forth all their efforts to retain it, which they succeeded in doing.

The stubborn and prolonged defence of Sebastopol was not accomplished without the most desperate efforts and appalling loss of life. The working parties employed amounted daily to from 5000 to 10,000 men, who frequently suffered severe losses. The want also of bombproof cover in or near the works, and the impossibility of providing it in the rocky soil, was severely felt. In daily anticipation of assault, strong reserves had to be constantly kept in rear of the works. These being much exposed suffered severe losses.

The total number of casualties incurred by the

Russians during the siege are put down at 93,625, out of which over 17,000 were killed.¹ Had the town been provided in advance with well-designed earthworks, containing good bombproof cover, then the excessive labours and losses which were endured would have been unnecessary, or could have been directed into more offensive operations in advance of the main line, and would in that case very likely have resulted in forcing the besiegers to re-embark.

The place was practically unfortified before the siege, and the above losses and hardships may be said to represent the price paid for this neglect. But all the devoted efforts of the Russian troops would have been of no avail without the genius which directed them. It is not, however, safe to rely on having a Todleben at hand to make up in times of war for the shortcomings of the administration in times of peace, nor is it right to sacrifice the lives of thousands of brave men through the previous parsimony or blindness of the national government. It is nearly fifty years since Sebastopol afforded us this lesson, but it is not evident that we have learnt it.

¹ Todleben.

CHAPTER VIII

SIEGES OF THE FRANCO-GERMAN WAR—TOUL—PHALZBURG—
BITSCH—STRASBURG—METZ—PARIS—BELFORT

It has apparently been considered that, owing to the fact that the achievements of the French fortresses in the war of 1870-71 were on the whole of a disappointing character, no useful lessons can be drawn from the operations. At all events, it is rare to find any systematic study made of the sieges, or deductions drawn from the results thereof, although the field operations of the same campaign have been the subject of ceaseless study, and have had an almost exclusive influence on English modes of tactics ever since. But it is believed that, when the attendant conditions are taken into account, it will be found that the poor results obtained in the defences were due to the antiquated and unsuitable nature of the works and the disorganised condition of the administrations and garrisons, and that notwithstanding this, the operations are not without interest nor wanting in useful lessons.

The history and teachings of the Franco-German War have been so closely studied by English military students that the tactical conditions which prevailed at that period are too well known to need description. As regards siege warfare, it is sufficient to say that, since Crimean days, the adoption by both the combatants of rifled breechloading small-arms and artillery had resulted in greatly increased range, accuracy, and rate of fire of all classes of weapons. The French, as is well known, were

possessed of a longer-ranging and better rifle than their opponents.

At the outbreak of the war France had on her northern and eastern frontiers an immense number of fortified places of various sizes and degrees of strength, which were a legacy from the Vauban era. The strategic methods and tactical conditions of the days in which they were built have already been described in a former chapter; and it is easy to understand that the great changes that had occurred in the 150 to 200 years that had elapsed since those days had not only greatly reduced the defensive power of the fortresses, but had caused many of them to entirely lose their strategic value. Of all the conditions that influence strategical action, none do so to a greater extent than communications. But these had greatly changed since the seventeenth century, particularly by the introduction of railways; hence we find that many of the fortresses which lay in 1870 off the main lines of road and rail used by the invaders were of no military value whatever, and were ignored by the Germans. It would have been far better if these useless fortresses had long before been abandoned, and the funds expended on their upkeep and armaments made available for the improvement of the more important places; the garrisons locked up in them during the war would also have been set free for useful work elsewhere. If this had been done, and some new and up-to-date fortresses constructed on points that had acquired a strategic importance by reason of their situation on the main line of advance on Paris, such as Châlons, Soissons, Rheims, &c., the course of the war might have been different.

Even in the case of those fortresses which were in a strategically useful situation, no action had been taken,

except in one or two instances, to strengthen and improve the defences, so as to bring them up to the standard of modern requirements and suit them to resist the weapons of the day. With the exception of Paris, which was built in 1840-44, all the fortresses were simple, continuous enceintes immediately surrounding towns, and were the work originally of Vauban, Cormontaigne, and their school. The addition of detached works outside the enceinte would at least have kept at a distance the enemy's long range artillery and prolonged the periods of defence, but Metz and Belfort were the only places where this had been done.

Though their armaments were generally sufficient, most of the French fortresses were deficient in organisation and preparation for war. It therefore often happened that when the German advanced guards appeared, they found the preparations for a siege incomplete and interrupted them. The garrisons, moreover, were in many cases merely *gardes mobiles* and other partially trained troops.

Toul.—The fortress of Toul occupied an important position on the main line of rail which, in August 1870, connected the Third German Army with its base of supply. Its reduction was therefore a matter of urgency. The fortress consisted of an enceinte of nine bastioned fronts, built after the old system with wet ditches, but no flank defence in the ditches, and with earthen counterscarps and revetted escarps. There were several ravelins, but no detached outworks. It lay in the valley of the Moselle, and was commanded by surrounding hills. The preparation of the defences for a siege was not completed; "neither the railway works, nor the houses in the neighbourhood, shutting in the fortifications, were destroyed or removed. The plantations left standing on

the glacis did certainly prevent the besiegers from seeing into the work, but the view from Mont St. Michel was entirely uninterrupted.”¹ The latter hill was some 2300 yards from the enceinte. There were no bombproof casemates and no bombproof magazines for powder, but a few blindages had been made on the ramparts. The garrison was about 2300, nearly all *gardes mobiles*. The place was invested, and batteries were opened on commanding sites at about 2500 yards range; a bombardment by field artillery was directed both against the works and the town, some 3000 rounds being fired. Then some heavy smooth-bore garrison artillery were brought up, and employed in the bombardment, which was carried on with some vigour, as on one day 1000 rounds were fired in nine hours. But this also “seemed not to produce the desired effect, owing to the invariably long range, the want of made-up ammunition, and the small striking force of the projectiles.” At last a complete siege train, consisting of ten rifled 24-pounders and sixteen rifled 12-pounders, arrived; fresh batteries were thrown up, and arrangements made to open a parallel 500 paces from the place for the purpose of advancing on the breach to be formed by the guns. The bombardment began; “no great result was anticipated from the fire of the siege artillery,” but it succeeded in overcoming the fire of the defenders’ ordnance and in setting several buildings and magazines on fire, so before the parallel was opened the fortress capitulated, having held out thirty-seven days. The immediate cause of the capitulation was the failure of the supply of artillery ammunition.

Phalzburg.—The fortress of Phalzburg, though it did not delay the advance of the German troops, was situated on the line of communication of the Third Army, so it

¹ Col. B. von Tiedemann’s “Siege Operations against France, 1870-71.”

was desirable to obtain possession of it. It consisted of an enceinte of six bastioned fronts with deep ditches, partly cut in the rock and partly revetted. There were bombproof barracks, casemates, and magazines, and hollow traverses in the bastion. There were no outworks, but the ravines and undulations of the ground in front were well seen into from the fortress. The place, therefore, was considered to be "perfectly secure against assault."¹ The garrison was about 1800 men.

The Sixth Prussian Army Corps received orders to make an attempt "to take the place by means of a bombardment." The fire of sixty field-guns was therefore directed against it for about twelve hours, altogether 1800 rounds being fired. The defenders replied with the fire of ten guns, which produced no effect. The fort "did not suffer much; but the houses in the town, especially those near the church, were much injured, although they were mostly of massive construction." This demonstration, for it cannot be called anything more, did not have the effect of intimidating the commandant into surrender, so the following day the Army Corps, whose advance could not be delayed, marched off, leaving two battalions in observation.

A few days later several fresh battalions with a field-battery arrived and formally invested the place. During the following month the garrison made several sorties, and the besiegers were further harassed by *franc-tireurs* from the country round. "A regular siege or serious bombardment of the place was contemplated; the idea, however, was abandoned when the difficulty was considered of making a breach in works founded partly on rock, and of approaching the place by sap. It was believed

¹ All the quotations in this chapter are from Von Tiedemann's "Siege Operations against France, 1870-71."

that the enemy's *moral* was already shaken, and that altogether the importance of Phalzburg was not such as to justify the sacrifice of time and stores, and of troops, which a siege would require." The blockade was kept up till disease and want of provisions began to tell on the garrison. An attempt was then made to hasten the fall by a bombardment, so on the 24th November the place was "heavily bombarded" (!) for six hours by the one field-battery of the besiegers. On the 12th December, provisions having become exhausted, the fortress surrendered, having sustained the siege for eighteen weeks.

Bitsch.—The fortress of Bitsch lay in the line of advance of the Second Bavarian Army Corps, who, being unable to stop for its reduction, were forced to march round it with great difficulty over bad roads. The work was built in 1741, and the most important part is an oblong enclosure on the top of a precipitous and rocky hill. Some forty feet below this, on the west side, is the lower enceinte surrounding the town, which consisted of bastioned fronts with high revetments and deep dry ditches. Part of this latter was of more recent construction, and at one corner had been added a citadel with deep ditches containing three caponiers, the interior being in the form of a massive bombproof redoubt. All over the fortress was ample bombproof accommodation for troops, stores, and ammunition—even the well was bombproof. The height of the upper works was such as to make the construction of approaches in the ground outside impracticable.

A siege train of sixteen heavy guns and four mortars was brought up, and a bombardment carried out for four days. "The results were inconsiderable, and it was not till the fourth day that the siege artillery succeeded in

setting fire to some of the few destructible buildings on the *place d'armes* of the fortress—a result, however, that did not have the smallest influence in inducing the commandant to surrender.” The existence of the excellent bombproof cover, of course, accounted for this result. “On the German side they were now convinced that a bombardment alone, even on a larger scale, would not suffice for the attainment of the object in view. A regular siege was not contemplated by the German military authorities, because it would have required a greater expenditure in material, troops, and stores than the value of the fortress would have justified.” The siege artillery was therefore sent away, and the place merely observed by a small force till the end of the war to prevent attacks by the garrison on the German communications. Bitsch was the only place which never surrendered.

Strasburg.—Strasburg was the capital of Alsace, and contained an important military depot, an arsenal, and a gun-factory. It also commanded the passage of the Rhine, and was therefore a fortress of the highest importance. The town was surrounded by a bastioned enceinte of considerable strength, augmented in many places by hornworks and advanced lunettes. At the east end was the citadel with five bastioned fronts, built by Vauban in 1685, with hornworks and other advanced works towards the Rhine. The citadel commanded the rest of the enceinte. The ditches could be filled with water, and a good deal of the ground in advance of some of the fronts could be inundated from the river Ill. There were no detached works. The bombproof cover within the fortress was inadequate. The preparations for defence were incomplete; they had, in fact, only just been begun when the Germans arrived. The garrison

consisted of some 11,000 regular troops and 7000 National Guards.

After some preliminary skirmishing and cannonading from field-guns, a siege train was brought up, and a heavy bombardment of the town carried on for three days from 120 pieces, of which 66 were heavy and 54 field-guns. The result was immense destruction of public and private buildings within the town, and great sufferings and loss of life to the soldiers and citizens. The governor of the fortress, however, declined to surrender.

It was then decided to undertake a regular siege, so a complete siege corps and an additional and heavy siege train were brought up; the latter included some 15 centimetre (6-inch) rifled guns and 21 centimetre (8.27 inch) mortars. Altogether the siege army was nearly 60,000 strong. The point selected for attack was the north-west angle of the enceinte, as its salient situation permitted of an attack on a narrow front, and the ground there was free of inundations. Siege batteries were thrown up, and the first parallel, with approaches from the rear, opened on the night of the 29th August. The parallel was about 4700 yards long, and was at an average distance of 800 yards from the fortress. A heavy bombardment was instituted the next day, the result of which was to silence the artillery of the defence. The attack then proceeded more or less according to rule. Zigzag approaches were made, and a second and then a third parallel thrown up in due course. These were all executed by ordinary trench-work under cover of night. One or two sorties were made by the garrison, but were repulsed without difficulty. Beyond the third parallel the advance had to be made by double sap. The glacis of the two advanced lunettes was crowned, a descent made into the ditch, and the counterscarp

of one of them blown in; the other had an unrevetted counterscarp. The wet ditches were crossed, one by a dam of earth and fascines, and the other by a bridge of casks. Both the lunettes were entered and found to be abandoned.

Lodgments were then made in these lunettes, and a battery for light guns constructed in one of them for the purpose of breaching the bastion in the rear, which was also battered from the batteries outside. The double sap was also pushed forward, and in a few days the counterguard of one of the bastions of the main enceinte had been crowned by the besiegers, and both bastions had been "reduced to shapeless ruins" by the German artillery. At the same time the bombardment of the city was vigorously continued. At this point the fortress suddenly surrendered.

It has been stated that the place should have held out longer; but there can hardly be any doubt that an assault would have been successful, as not only was there a practicable breach, but so incessant and accurate a fire was kept up by the besiegers on the ramparts and road in rear of them, that to stand on those places was impossible, and troops assembling to repel an assault would have been shot down. There were other causes too which led to the capitulation. The state of discipline of the troops, composed partly of National Guards, of refugees from the defeat of Worth, and other odds and ends, was bad; the supply of provisions had run short, and it was believed that many of the inhabitants had German sympathies; at all events, the populace were opposed to a lengthened defence, and constantly put pressure on the governor to surrender.

Metz.—Metz was a place of the highest strategical importance, and was accounted the strongest fortress in

Europe. The enceinte consisted of bastioned fronts, with ravelins and ditches that could be flooded from the Moselle. On the south side was a crownwork and some advanced lunettes, while the strong forts of Belle Croix and La Moselle further guarded the east and west fronts. All the above formed the inner line of defence. Around these, and from 3000 to 5000 paces distant from them, had been provided a girdle of strong detached forts on the heights and points of tactical importance. It was these that conferred on Metz its great defensive strength, for they secured the main work from bombardment, and rendered it very difficult to completely surround the place, owing to the great circumference of the circle which the investing force would have to occupy. Also they permitted of the concentration of great forces on any point, and afforded complete tactical freedom and opportunity for counter-attack.

All the forts were connected by telegraph with the main work, and to some extent with one another. Metz contained an ample armament and an immense amount of military stores of all kinds. The garrison, when the place was first invested, amounted, including National Guards, to 30,000 men. Notwithstanding the great importance of the place, at the outset of the campaign the fortress was unprepared for a siege; serious preparations as regards the works and armament were only commenced after the battle of Forbach, and had to be carried on after the place had been invested. To assist in this work 15,000 peasants were brought in from the country, and these were unable to get out again, and had to be subsisted. It might be expected that an account of the siege of a fortress of this nature would throw a light on the defensive capabilities of a girdle of detached forts, and permit of some useful lessons being drawn.

Unfortunately, the example of Metz affords no guide of this sort, as the works were never attacked. As soon as Bazaine committed the fundamental error of allowing his field army of 150,000 men to be shut up in this fortress, which was only provisioned and supplied for its proper garrison of 30,000, the course of the Germans was clear. They only had to prevent this force getting out again, and its surrender from starvation became a matter of a short time. Accordingly, they strongly entrenched their investing lines, with a view to prevent surprise by an advance in force of the French, and to detain them long enough to permit of the troops being concentrated in sufficient numbers to oppose them. To assist in this object they made lateral communications, threw bridges over the Moselle above and below the fortress, and provided telegraphic communication between the different parts of their lines. The French made a desperate effort to force a way out on the 31st August and 1st September (known as the battle of Noisseville), and by several minor sorties subsequently, the principal of which took place at Woippy on the 7th October, but all were unsuccessful. Provisions having become exhausted and the supply of ammunition having run very low, Marshal Bazaine capitulated on the 24th October, after sixty-seven days' blockade, and his army of 179,000 became prisoners of war. It is worthy of note that the German investing force numbered 230,000 men, and their outpost line occupied a front of twenty-eight miles.

Paris.—The siege operations before Paris were the most important and most interesting of any in the war. Space, however, does not admit of a detailed account of them, though this would be particularly instructive; it must suffice to review the most noticeable conditions and illustrative circumstances, with a view to gauging

their bearing on the general principles of the defensive art. A general description of the detached forts has been given in Chapter III.¹ Nearly all the permanent ones fell far short of fulfilling the fundamental conditions of defensive works. The archaic form of trace has already been noticed, by reason of which only a fraction of their armament could be brought to bear on the besiegers' batteries, and many of the faces could be taken in enfilade and even in reverse. The revetments and the casements and barracks within the works were in many cases hopelessly exposed.

As usual in French fortresses, the works and armament had not been prepared for defence when war broke out. Great efforts were, however, made after the battle of Worth to put the enceinte in a proper state, to defend all gates and entrances, and to construct subsidiary works for infantry and guns in the outer line of the forts. These new works were designed with a good deal of skill, and resulted in a great increase in the number of guns of position. It is instructive to note that we find several instances of the guns in the permanent works having been rapidly silenced by the besiegers' artillery, while it is more than once mentioned that considerable trouble was experienced in overcoming the fire of some of these provisional batteries. Works were also constructed on certain hills and commanding ground in front of the line of permanent forts, in places which from the increase in range of weapons had become sources of danger.

The garrison of Paris consisted at first of some 250,000 men, of whom only 80,000 were regulars, the remainder being National Guards and *Gardes Mobiles*, &c. During the course of the siege further levies

¹ See *ante*, p. 35.

were made of all the male population of the necessary age, and by this means the force was nearly doubled in numbers. In everything except numbers, in discipline, cohesion, training, and organisation, it was most woefully deficient. Capable leaders were also wanting; even reliable junior officers and non-commissioned officers were not forthcoming in sufficient numbers. For offensive enterprises and concerted movements, therefore, the Paris garrison was eminently unfit. Even the fortress artillery appear to have been equally untrained and disorganised. "The fire of the batteries on the (besiegers') works was kept up with an inexcusable waste of ammunition, apparently according to no pre-arranged plan, and without skilful supervision. . . . Frequently costly projectiles were fired at solitary patrols, and objects were aimed at in other cases without good reason that could be assigned. . . . The garrison artillery paid not the least attention to watching their fire for the purpose of fixing its elevation and direction; similarly they appeared to profit but little by the great advantage they had on their side of being able to ascertain the distances accurately. Under these circumstances the possession of the best material was of no use to them."

The German investing force consisted at first only of the Third Army, 140,000 strong. The curious spectacle was thus shown of a force of 250,000 being invested by one of 140,000, which had, moreover, to cover a line fifty miles in extent. The superior generalship, organisation, and discipline of the Germans made up for their inferiority in numbers, and the investment was rapidly and successfully carried out. The besieging army was subsequently augmented by two army corps, making up the strength to 220,000, and also a

great train of siege artillery. The French made many sorties; small ones to molest and alarm the besiegers' outposts, and to make demonstrations for special purposes; and great sorties *en masse* for the purpose of breaking through the investing line, and forming a junction with the French armies operating in the north, south, and west of France. The Germans always had foreknowledge of intended sorties, sometimes from spies and deserters, but generally from the fact of the preparations and movements of troops being clearly visible. Many of the sorties led to very severe fighting, but all ended in failure.

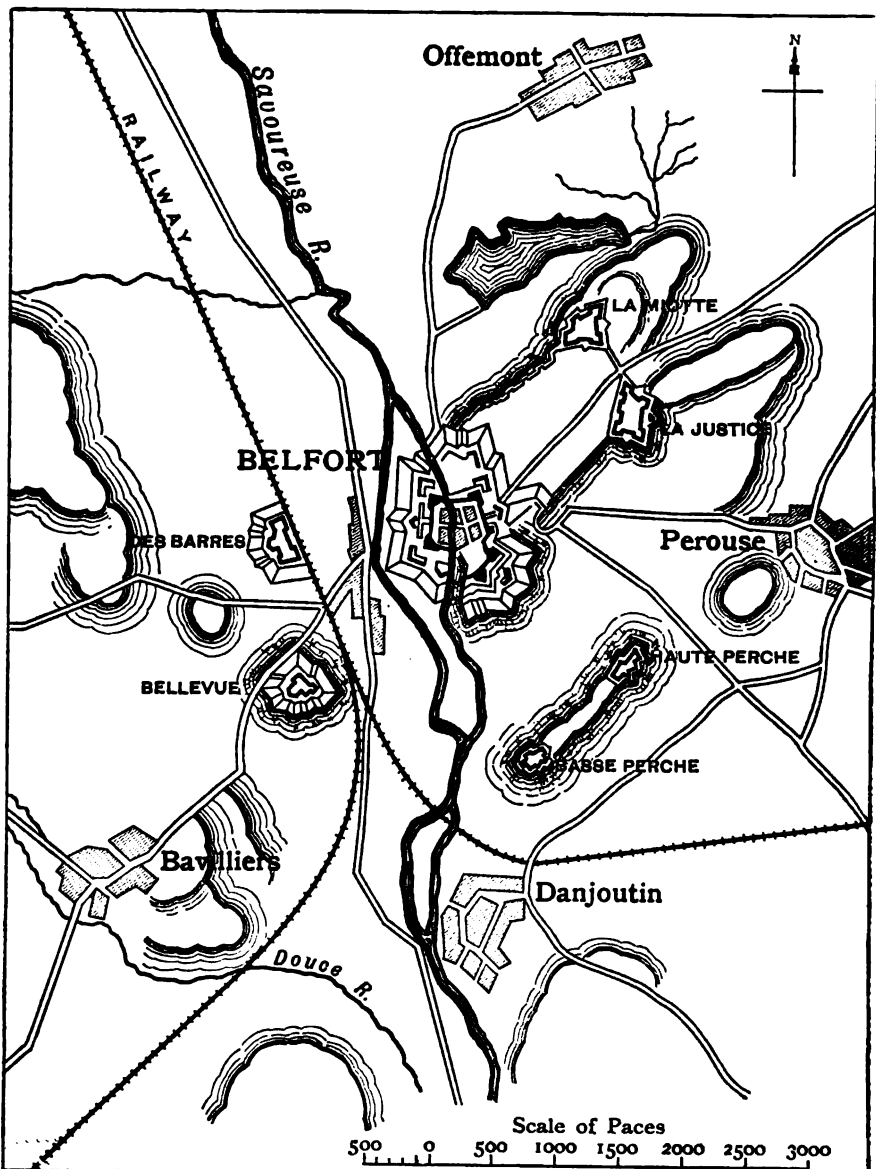
The Germans made no attempt at regular attack of any of the works, either by assault or formal siege. They entrenched their lines of investment, made communications, both road and telegraphic, and set up a great number of siege batteries. The works and the city were then subjected to a severe bombardment from three sides, the south, the east, and the north, and this was kept up continuously for about a month. At the same time a rigid blockade was instituted, and all efforts of the garrison to break out were foiled. These measures produced an immense destruction of property in the city, and great privations among the troops and inhabitants by want of food, which, combined with the riotous behaviour of the Parisian populace, led eventually to the fall of the capital, the siege having lasted in all 131 days.

The most important of the lessons which may be derived from the defence of Paris may be found in a consideration of the fatal results which arise from want of preparation and organisation, want of unity in the commands, and discipline and training in the troops. It has been sometimes said that the defence of Paris, lasting

as it did over four months, was a creditable achievement; no doubt it was the best that could be done under the unfavourable conditions mentioned above. But had the generalship, organisation, and training of the French been of the same high order as were apparent on the German side—had they, in fact, been up to the standard which it is reasonable to expect in a fortress of the first class, particularly when it defends the capital of a great state; then, with their numerical advantage, immense resources, interior position, and defensive works, they should have been able to ward off with ease all attacks, and render utterly hopeless any attempt at investment by the force which the Germans were able to bring up. As it is, the defence may have been creditable to the valour and endurance of the troops engaged, but not to their leaders, or to the nation which allowed its capital city to be found in so disorganised a defensive condition.

Belfort.—The defence of Belfort affords an effective contrast to that of Paris in these very conditions which have just been mentioned, and forms one of the brightest episodes in the history of the French conduct of the war. The fortress was of considerable strategical importance, so its possession by the Germans was a matter of necessity. Belfort was fortunate in the possession of a commandant of exceptional capacity and resolution in the person of Colonel Denfert of the Engineers. Immediately on the outbreak of the war he took energetic measures to prepare the place for defence, bringing up heavy guns, ammunition, and provisions, and the long time that elapsed before he was invested gave him an opportunity which he made good use of. The town was surrounded by a bastioned enceinte, with a commanding citadel planned by Vauban, and possessed bombproof barracks.





On the north-east side were two strong detached forts, called La Justice and La Miotte, on the outlying spurs of a ridge which runs out from the town. On the south-west, on isolated hills, were two other newly constructed works, Fort des Barres and Fort Bellevue. On the south-east of the town, and some 2000 paces from the enceinte, lay a ridge called La Perche. This had not been occupied, no doubt owing to the fact that when the fortress was built it was beyond the range of the guns of the period. It was now evidently a source of danger, so the commandant at once set about the construction upon it of two strong field redoubts called Haute Perche and Basse Perche. These "had each a front of from 350 to 400 paces, provided with two large and roomy blockhouses in the gorge, the ditches being blasted out of the solid rock with perpendicular sides, nine feet deep; the ground plan had the form of a redoubt with a very broken crest-line; on either side of the gorge were shelter trenches." The Basse Perche was on the same level as the citadel; the Haute Perche was 30 feet higher, and so commanded the citadel. The various detached works were so well situated and had so good a command that they are said to have been capable of bringing a heavy fire on every part of the ground in front which could be occupied by a besieger. The garrison consisted of 17,000 men, part of whom were *Gardes Mobiles*.

When the Germans first invested the place, several outlying villages, notably the large ones of Danjoutin and Bavilliers, about 1500 paces in advance of the line of detached works on the south and south-west, were occupied by the French. Bavilliers was captured by the Germans by a night attack on the 28th November, but Danjoutin, after repulsing an attack

on the 14th December, remained in the hands of the French till the 8th January, when it fell to a night attack, after having been subjected to bombardment by siege artillery. The month of November was occupied by the attackers in gradually pushing back the French outposts, and driving them step by step out of the outlying villages. A number of siege batteries were constructed, and a bombardment opened on the works and occupied villages on the south-west. The French made several counter-attacks with a view to regaining Bavilliers and the other lost villages, but without success.

In December and early January the besieging force was threatened by the movements of a French army under Bourbaki, so not much progress could be made with the siege works, though the village of Danjoutin was captured. The actions on the Lisaine, however, removed the danger which threatened from Bourbaki's force, so the siege was prosecuted with vigour.

On the 21st January parallels and approaches were commenced against the two Perches redoubts, and a number of additional batteries made. The work was greatly hampered by the rocky nature of the soil and the hard frost which prevailed.

As there were pressing reasons for bringing the siege to a speedy conclusion, assaults were delivered on the Perches redoubts on the night of the 26th January. Both the assaulting columns were much impeded by wire entanglement, which had been formed between the stumps of felled trees. The advance on the Haute Perche was screened by an undulation of the ground during the greater portion of the advance, but when it became visible it was received with so heavy a fire that it melted away. The column against the Basse Perche got into the ditches, but Colonel Denfert, in expectation

of such an assault, had placed a strong reserve in rear of the forts; these advancing at the right moment repulsed the attack, and took a lot of prisoners. The assaults, therefore, totally failed.

The systematic approach was again resorted to, a second parallel and approaches being constructed, and siege guns pushed forward level with them. On the 1st February the approaches had reached the counterscarps of the two works. On the 8th the latter was found to be abandoned, and the Germans took possession of them. A lodgment was made, and some guns brought into the fort under a heavy fire from the citadel of the main fortress, and in the next few days the Perche heights were turned into a formidable artillery position for 60 guns to fire against the citadel and main enceinte. Approaches were also pushed forward by sappers against these latter. On the 13th February the commandant received instructions from the French government to surrender the fortress, in view of the armistice and negotiations for peace which followed the fall of Paris. This was accordingly done, the defence having lasted 101 days. The garrison marched out with all the honours of war, and received free passage into the region occupied by French troops.

It is an interesting speculation as to how long the elaborate defences of the citadel and enceinte would have held out after the fall of the Perche redoubts, if the armistice had not brought about the evacuation of the fortress. In view, however, of the imposing artillery preparations made by the besiegers, it is difficult to believe that it would have been long. On the other hand, the hastily constructed works on La Perche amply justified their existence, as they necessitated a formal trench attack involving great loss of time. Their trace

was of simple character, giving good frontal fire, which was further increased by trenches on each flank; they possessed shelter for their garrisons, and good obstacles in the shape of entanglements in front and steep rock-cut ditches. They thus fulfilled all the essential conditions of a defensive work.

Altogether the achievement of the commandant of Belfort is deserving of the highest praise. He had to contend against many difficulties—smallpox and dysentery, insubordination in the *Gardes Mobiles*, fires, want of ammunition and of money. Yet his measures were carried out with the utmost thoroughness and foresight. Most noticeable of all were his excellent tactical dispositions; defensive positions well in front of the lines of works were held, and only yielded after a step by step resistance, which greatly delayed the enemy's advance; in fact, it was not till the 21st January, or eleven weeks after the beginning of the siege, that the last of the outlying villages, La Perouse, was captured, and the defenders finally confined to their line of works. Frequent counter-attacks were also made, and the artillery was vigorously and ably handled. It is probable, however, that the siege would have been of shorter duration had not the menacing attitude of Bourbaki's and other exterior French forces prevented the besiegers' operations from being as vigorously conducted in the months of November and December as they were in the last weeks of January and early February. The investing force numbered at the beginning about 15,000, but was afterwards increased to 25,000 with a powerful siege train. Their losses amounted to 2100.

There were many other sieges in the course of the war, but it is not necessary to describe them in detail.

Longwy and Verdun made fairly creditable defences considering the antiquated nature of their works. The remainder succumbed after short bombardments, often merely of field guns, and sometimes yielded to mere threats. They were as disorganised as possible, and their defences generally beneath contempt.

There are several points in the mode of conduct of the various Franco-German sieges which are worthy of notice, as tending to throw a light on the progress of the defensive art. One is that we hear very little of any great destructive effect being produced either on the defence works or on their garrisons by the artillery fire of the besiegers. Great effects were produced against buildings in the towns, and the consequent loss and suffering to the civilian population in many cases contributed to the early fall of the places; but there is nothing to show that the greatly increased power of artillery had conferred a proportionate superiority on the attack, when directed against properly designed works. The small damage done to the provisional works at Paris is particularly mentioned; only the ill-designed permanent forts suffered anything worth mentioning, while the losses among the garrisons were extremely small in proportion to the number of rounds fired. The effect of the artillery of the defence was always considerably less still. Another remarkable point is that, except once at Belfort, the Germans never ventured on an assault, even when the capture of the place was a matter of urgency. This is in curious contrast to the practice at the Peninsular sieges. It has sometimes been said that this is attributable to an excess of caution or want of enterprise in the German character, but their achievements in the other parts of the theatre of war in no way warrant such a con-

clusion, and it is more reasonable to attribute it to the fact that the Germans were well aware of the greatly increased power conferred on the defenders by the breech-loading rifle, which enabled a far greater density of fire to be brought to bear on the assaulting columns. This is a condition worthy of the most careful attention, as pointing to the conclusion, which is confirmed in all later campaigns, that the main weapon of the defence is the *rifle*.

The Germans displayed great reluctance to embark on the long and arduous operations of systematic siege. They always first tried the effect of a heavy bombardment, and often confined themselves to this alone or combined with blockade. The reason of this must have been that they relied on the disorganisation of the French garrisons, their state of unpreparedness as regards supplies and munitions, and the heavy loss and suffering to the civilian population bringing about an early capitulation; the event often justified them in this belief.

Of the want of organisation, of concerted tactical action (except at Belfort), of any idea of the proper work of artillery, displayed by the defenders in these sieges it is unnecessary to make further mention, as the narratives of the operations express them clearly. The thoroughly superannuated nature of the works prevents them being as clearly illustrative of the principles of the defensive art as might be wished; but, although the lessons obtained are of a negative character, showing rather what form works should not take than what form they should take, yet it is believed that important deductions may be drawn as to the tactical side of the question, and lessons learnt which will be of high value in aid of endeavours to formulate a proper mode of defensive action for a later day.

CHAPTER IX

PLEVNA—THE SUPREMACY OF THE RIFLE ESTABLISHED— EARTHWORKS

THE defence of Plevna may be said to have inaugurated a new era in defensive warfare, if not, indeed, in all forms of warfare, that is to say, the era of the supremacy of the rifle. It is true that the magazine rifle was unknown at that date, but what is meant is that these operations were the first to exemplify the enormous moral and actual effect of the rapid fire of breech-loading rifles in the hands of good troops on the defensive and well entrenched. The weapons employed on both sides in the Russo-Turkish war of 1877-78 did not differ in any essential respects from those made use of in the Franco-German campaign of seven years previously, though improvements in the breech mechanism had somewhat increased the rapidity of fire. The armament of the Turks was distinctly superior to that possessed by the Russians; their small-arm was the Martini-Peabody, of .45 calibre, a weapon of American manufacture; while that of the Russians was the old musket, converted into a breech-loader by the Krenk system. The Turks possessed far less artillery than their enemies, but it was all composed of Krupp's steel breech-loading guns, of 8 and 9 centimetres calibre, that of the Russians being old pattern bronze weapons, far inferior in range and accuracy.

Plevna was a little town of about 7000 inhabitants,

lying in the midst of a series of hills, whose crests were from 200 to 600 feet above the town. It derived its military importance from the fact that an army posted there was a vital menace to the safety of the Russian communications in any advance. At the time when Osman's army arrived in the place no fortifications existed of any kind whatever. On the 20th July 1877, there took place what is known to history as the first battle of Plevna, and the only works existing on that date were a few light trenches hastily thrown up after the arrival of the Turks the evening before. The Russian army under Krudener had just captured the fortress of Nikopolis, which lay some twenty miles north of Plevna, and had received orders to occupy the latter place at once. General Schilder-Schuldner was, therefore, sent forward with some 7000 men to perform this operation. He made no attempt at reconnaissance, his cavalry for the most part moving far out on his flanks, so at 2 P.M. on the 19th July his main body stumbled against the Turks, of whose strength he was utterly unaware, and who were posted on the Grivitza heights east of Plevna. Osman Pasha had at that time not less than 15,000 men, probably more, in and around Plevna. The little Russian force, on bivouacking that night, were distributed over a distance of seventeen miles; while the position of the Turks was well concentrated and admitted of easy communication with all parts.

Schilder-Schuldner ordered an attack on all sides at daybreak the next morning (July 20th). A regiment of Don Cossacks who made the attack from the north (the extreme right of the Russian line) were rapidly driven off by the Turks. On the north-east three batteries were brought into action at about 2500 yards' range against the Grivitza ridge. After an hour's

cannonading an assault was delivered by two regiments (six battalions), the western end of the Turkish advanced lines were driven in, and the Russians captured the village of Bukova. After a short while, however, the Turks brought up reinforcements, and making a vigorous counter-attack, put the Russians to flight in great disorder. Meanwhile, on the east (left of the Russian position) one regiment and two batteries had advanced on Grivitza village, and, carrying the lines of Turkish trenches, had penetrated almost to the eastern edge of the town of Plevna. Here, however, the retreating Turks were reorganised, and, some reserves being brought up, a counter-attack was delivered, which resulted in the Russians being driven back with great slaughter. On the extreme Russian left (south) a Cossack brigade made a feeble demonstration, then, turning eastward, covered the retreat of the other columns. By midday all the Russian columns were in full retreat. Their losses were nearly 3000 killed and wounded, or over a third of the number engaged.

The Turks did not pursue them beyond the confines of their own lines, the reason for this probably being the extreme exhaustion of the men, who, it must be remembered, had only arrived the afternoon before from a forced march of 115 miles in seven days.

From the defensive point of view, the tactical lessons of this battle are less convincing than they otherwise would be, on account of the extraordinarily bad tactical handling which characterised the Russian attacks. Their columns were launched to the attack on independent, converging lines, starting far apart, with no communication between them, and no means of bringing up reserves to any of them. The result of this was that the successful attacks on the right and left could not be followed

up, and fell an easy prey to the strong reinforcements which the central position of the Turks enabled them to bring up.

In the days following this battle the Turks worked with the utmost diligence at throwing up provisional fortifications in the shape of small closed redoubts, generally of square or semi-hexagonal trace, connected by musketry trenches. On the heights above Grivitza were constructed two strong works, afterwards known as Grivitza redoubts Nos. 1 and 2, and along the ridge to the east of them several smaller works, connected by trenches, these being adapted to the contour of the ground, and forming a very strong defensive position. On the hills to the south and east of the town were other groups of works, while on the north and some two miles in advance of the Grivitza ridge were several works defending the village of Opanetz. It will be seen therefore that the defences of the left wing faced north, except the Grivitza redoubts which faced east, and those of the right wing south-east and south. In the location of the works and the general organisation of the defences consummate ability was shown. No attempt was made to occupy the whole of the widely extended line of defence, but only such hills as commanded the approaches in such a manner as to render their attack by the enemy a matter of necessity. On these the works were so placed as to sweep with their fire the whole of the ground over which the enemy could advance. The Turkish soldier possesses a natural faculty for entrenching himself, so the works were well and strongly constructed and contained plenty of cover; in many of the redoubts even overhead cover from artillery fire was provided. Large quantities of supplies and stores were brought up from Orkanye, and arrangements made for their distribution; the communi-

cations were perfected, and every possible preparation was made for the second attack which was seen to be imminent. Reinforcements received from Sofia brought up the Turkish force to a strength of over 20,000 men and 57 guns.

Meanwhile Krudener had proceeded in person to the neighbourhood of Plevna with a view to conducting the next attack. His forces had been greatly augmented, till they stood at approximately 30,000 men and 176 guns. After a careful reconnoissance he gave orders for the assault to take place on the 30th July, and this formed what is known as the second battle of Plevna.

The attack was made in a very similar manner to that of the previous occasion. On the extreme right and left cavalry were posted to observe the enemy and protect the flanks, while between these two strong columns delivered the main attacks, one from the east on the Grivitza redoubts, and the other from the south-east on the middle group of works on the hills to the east of the town. The Grivitza redoubts being the key of the position, the largest force was directed against them, namely 18 battalions and 80 guns, while 12 battalions and 52 guns formed the left column. These two columns were so widely separated that there was no chance of their rendering each other any assistance, but a general reserve of 12 battalions was kept under the orders of Krudener himself.

Soon after 7 A.M. both the Russian columns commenced their advance. At 8.30 the right column halted to the east of the Grivitza redoubts, and brought its artillery into action at 3000 yards' range. A bombardment was commenced and kept up till 2.30 P.M. The left column did almost exactly the same, and bombarded the middle group of works at about 2500 yards' range.

The Turkish batteries replied vigorously. The effects of the Russian fire on the Turkish works was extremely small; in fact, the result of the artillery duel was, if anything, in favour of the Turks, whose guns were of a superior nature and better served than those of the Russians.

At half-past two the infantry columns advanced to the assault. The right or Grivitza force was formed into two columns, one advancing from the north-east on the Janik Bair redoubts, and the other from the east on the Grivitza redoubts. The leading regiment of the former carried the two advanced lines of trenches, and then rushed for the redoubt behind them. Here, however, they were stopped by the deadly hail of bullets from the parapets of the redoubt and the trenches alongside it, and fell back, having lost in a few minutes more than a third of their men and half their officers (29 officers and 1006 men). After a while they renewed the attack with another regiment, but with no greater success; at the same time two other regiments tried to get in on the right, but were also driven back by the heavy fire from the redoubt and trenches. In the meanwhile the eastern column crossed the ravine just to the north of Grivitza village and attacked No. 1 Redoubt. Here also they could not face the appalling hail of bullets, and stopped and took cover some 400 yards short of the work. Just before sunset the assaults were renewed with desperation from all sides, and some of the companies succeeded in getting into the trenches on the flanks of the northern redoubt, but they were driven out, and finally the Russians took to flight in the wildest disorder. So ended in total failure the attack on the right wing.

On the left wing the other column, which was under the command of Major-General Shakofskoi, advanced at

half-past two from Radischevo against the works of the middle group to the east and south-east of the town of Plevna. Although received by a murderous fire, the Russian columns gradually pressed on, carried the advanced line of trenches, and by 5 P.M. had gained possession of the two foremost redoubts of this group. The Turks then made several counter-attacks, and also massed strong bodies of troops on the flanks of the Russian line. Several charges and counter-charges followed, but at sunset the Russians were finally driven back and the redoubts retaken. Thus the attack on the left wing also ended in defeat.

Meanwhile the Russian cavalry on the extreme left (south of Plevna), who were commanded by the afterwards famous General Skobeleff, had achieved some measure of success. Although they were small in numbers, and had been told off by their orders to a very negative rôle, they were handled with great skill and intrepidity, and by means of vigorous demonstrations succeeded in preventing the Turks from turning the left of Shakofskoi's line and severing his communications. At nightfall they withdrew in good order.

The Russian losses in killed and wounded during this disastrous day amounted to 169 officers and 7136 men, or over 25 per cent. of the troops engaged. The Turks are said to have lost some 2000 men.

As in the first battle, so in this one, the Russian attacks were characterised by bad tactical handling. It has already been shown how the main attacks were made in two columns far apart with no means of inter-communication. The reserve troops also were frittered away, instead of being launched into the fight entire just at the moment when it hung in the balance. In the attacks on the Grivitza redoubt the regiments were sent

forward in a disconnected manner, one after the other, and so were beaten in detail. But notwithstanding these faults, it is abundantly evident that the real cause of the Russian defeat was the terrific effect of the quick fire of the Turkish infantry, aided, no doubt, by the very dense formation in which the Russians assaulted. The utmost bravery and resolution—and these qualities were by no means wanting on the Russian side—was unavailing under these conditions.

The following account of the Russian attack on one of the northern Grivitza redoubts, from the pen of one who participated in the defence, gives a vivid picture of the desperate contest:¹—

“A few minutes after our skirmishers had reached shelter the assailants appeared.

“They seemed to have no advance line of skirmishers. Serried ranks of infantry—three battalions, I believe—climbed in a solid body the bank of the last ditch, and advanced in a line parallel to the redoubt. The attack was thus perfectly frontal, without any attempt to circumvent our position. . . . Hardly had the Russians appeared when a dozen bugles sounded ‘Fire,’ and a terrific quick-fire, coming from three sides (the redoubt and both side trenches, defended by ten companies), and joined by the thunder of the guns, brought the enemy’s advance to a dead stop.

“The Russians retreated to the trench and the declivity beyond, whence they directed a violent fire on us without inflicting punishment. After a while they renewed the attack, this time with a smaller body of men (one battalion, I should think), in a long-drawn-out line, which afforded a less advantageous target than the dense masses of the first attempt. Dropping men at

¹ “The Defence of Plevna,” by W. V. Herbert.

every step, they rushed towards us with cries of 'Hurrah,' amidst a terrific fire from the flanks and the front. The battalion must have been as good as annihilated before it came within charging distance. The survivors went back and were swallowed up by a second line, which had meanwhile commenced to advance. A third followed at a short distance. These two got as far as the foot of the redoubt, and proceeded to climb the slope, which formed an angle of 45 degrees. There was for a few moments a confusion such as I could not have conceived in the boldest flight of my imagination. . . . Soon all the men were on the parapet; the Russians surged towards, and recoiled from, the slope like the waves of a tempestuous ocean; there was a mighty roar, coming from some thousands of throats—a roar which rose and fell like that of the storm-tormented surf; the guns fired into the charging mass; in the side trenches volley succeeded volley with terrific rapidity and murderous effect, and back went the Russian lines in a state of hopeless chaos, leaving the ground strewn with dead and dying."

Throughout August the Turks, in the confident expectation of another attack as soon as the Russians had been re-organised and reinforced, worked with the utmost assiduity at strengthening and extending the fortifications of their positions.

"An infectious desire, which never relaxed till Plevna fell, seized the soldiers to dig themselves in like moles. Apart from the great redoubts occupied by battalions and batteries, with their systems of front and flank trenches, there were minor entrenchments innumerable for outposts and sentries; sheltered ways connecting the redoubts with each other; for the reserves and stores protected encampments and magazines in the rear. Many

of these minor fortifications were erected by company leaders, and sometimes by non-commissioned officers on their own initiative. I, personally, caused to be erected, on my own responsibility, several small works, none of which were marked on the plans.

“This furious, quite spontaneous, and constantly growing desire of the soldiers to dig themselves deeper and deeper into the ground, without pressure being exercised by the commanders, struck me as being a remarkable feature.”¹

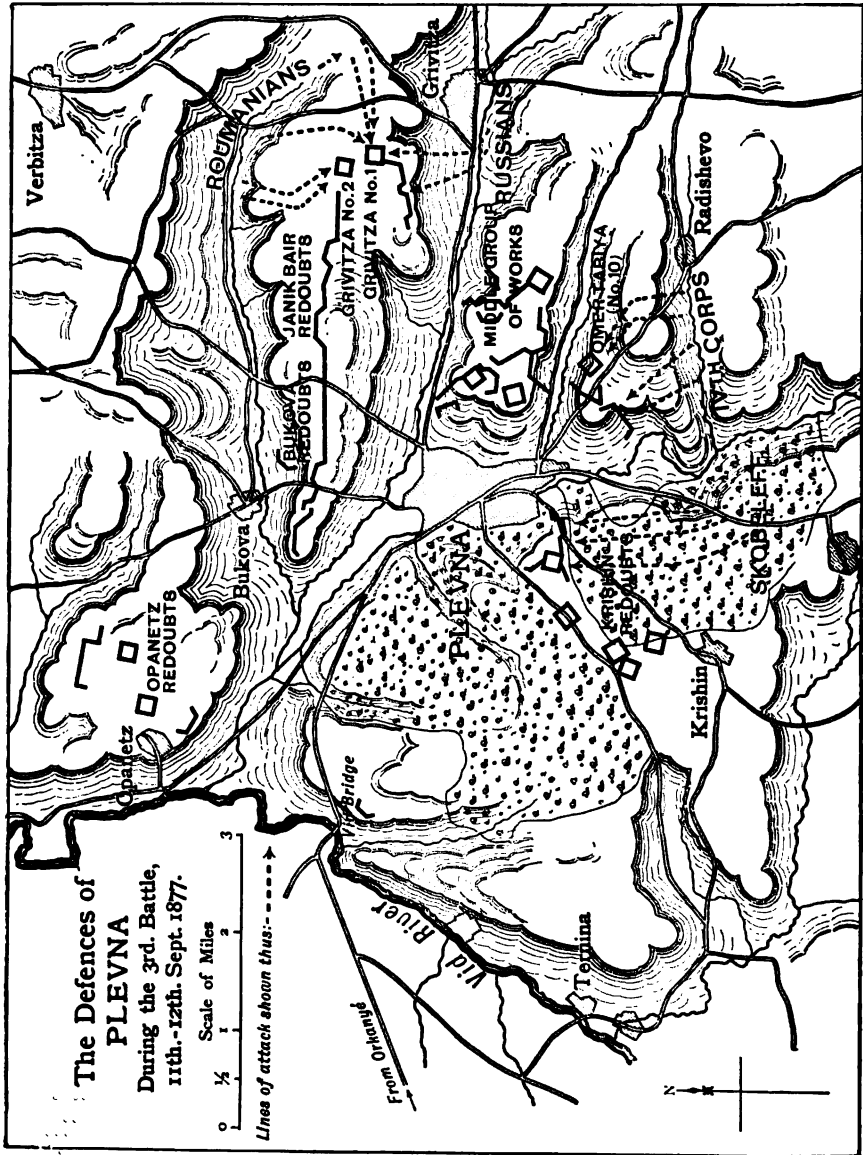
During this time a considerable number of new works were constructed, particularly on the south and southwest of the town, the most important being a group of strong redoubts to the north of the village of Krishin. The existing lines of defence were also greatly strengthened, and overhead cover for protection of the garrisons against artillery fire almost everywhere provided.

After the failure of the second attack, the Russians had invited and obtained the aid of the Roumanian army, and had also called out their own militia and reserves, with the result that at the beginning of September their forces before Plevna amounted to over 90,000 men, of whom 74,000 were infantry, and 10,000 cavalry. Their artillery consisted of 364 field-guns and 54 horse-guns; of these about half were 9-pounders and half 4-pounders. They had also 24 siege-guns, mostly 24-pounders of 6-inch calibre. The strength of the Turkish army inside the place at that time was approximately 30,000 men and 72 guns.

On the 6th September the leading Russian corps were pushed forward towards the Grivitza position, and the construction of siege batteries put in hand. On the morning of the 7th the bombardment began, at

¹ Herbert.





ranges from 2700 to 5200 yards. During this day the Russians had 20 siege-guns and 88 9-pounder field-guns in action. "Most of their fire was concentrated on the Grivitza redoubt, a square earthwork with parapets 18 feet thick; and the firing was reasonably accurate, a cloud of dirt being thrown up from the parapet every few minutes; yet the eight guns of this redoubt continued to answer all day."¹

On the following day the whole of the rest of the Russian artillery was brought into action against the remaining faces of the Turkish position. Throughout the 8th, 9th, and 10th the cannonade was kept up without abatement. The Turkish batteries replied with vigour, though towards the end some of them gave out for want of ammunition. The results of the four days' bombardment were trifling. "The redoubts were on the 11th in much the same condition as they had been on the 6th, the trifling damage done during the day having been repaired at night. Fresh works had actually been constructed; for instance, the trenches of Omer Tabiya. . . . The Turkish soldiers, so far from being demoralised, simply laughed at the Russian batteries. That was the result of 30,000 shells received during those four days. The reason of this ridiculous failure is to be found in the fact that the Russian guns fired from distances unsuitable to their make and calibre. The Russian artillerymen were remarkably timid; in every respect the Turkish gunners were their superiors."²

On the 11th September the bombardment was continued from early morning till 3 P.M., which was the hour fixed for the general assault. It had been decided that the assaults were to be directed upon three prin-

¹ Green, "The Russian Army and its Campaigns in Turkey in 1877-78."

² W. V. Herbert, "The Defence of Plevna."

cial points, namely, the Grivitza redoubts; No. 10 Redoubt (Omer Tabiya), which lay about a mile to the south-east of the town; and the two works lying close to the town on the south. The first was to be made by the Roumanians and part of the Ninth Russian Corps, the second by the Fourth Russian Corps, while a force under the redoubtable Skobelev was to make the third.

About 10 A.M., taking advantage of a thick mist, Skobelev began to move his troops forward along the eminence known as the Green Hills towards the redoubts on the south of Plevna. As the mist lifted, his troops became exposed to the fire of the Turks in the works on his front and on his left, the latter being the newly-constructed Krishin group of redoubts. Some lively skirmishing ensued. In the course of this two regiments of the Fourth Russian Corps impetuously advanced to the attack of the trenches near No. 10 Redoubt. Here they were met by a terrible fire and driven back, with a loss of half their men and two-thirds of their officers.

At 3 P.M. the troops told off for the attack on the Grivitza position commenced their advance; the three Roumanian columns, who came from the north and north-east, made their assaults in a disjointed manner, one after another, and were defeated in detail. The Russian brigade, advancing against No. 1 Redoubt from Grivitza village, which lay to the south of it, succeeded in spite of the heavy fire, in working up close to their object; they then made a rush for the redoubt, and, at the same time, a column of Roumanian reserves attacked the same work fiercely from the east. These attacks were successful, both columns entering the work at the same time. The Turks, however, kept up a terrible fire from No. 2 Redoubt, which was only a few hundred yards

off to the north, and in the fast gathering dusk charges and counter-charges ensued, during which the redoubt changed hands more than once; the final result, however, was that Grivitza No. 1 remained in the hands of the Roumanians, but No. 2 was retained by the Turks. The combined Russian and Roumanian losses in these assaults on the Grivitza redoubts amounted to 78 officers and 3816 men killed and wounded out of about 25,000 engaged.

The attack by the Fourth Corps on the south-eastern works (Redoubt No. 10), was somewhat weakened by the mishap which had occurred to the two regiments of that corps in the morning, but at 3 P.M. the remainder of the corps advanced to the attack. Here, again, the assaults were defeated in detail. The general reserve, which was ordered up to support this attack, arrived too late to be of any use. The Russian losses in this part of the field were 110 officers and 5200 men.

Meanwhile, on the south side, the troops under Skobelev, admirably handled, well supported, and animated by the gallant example of their leader, had succeeded in capturing one of the redoubts which supported Plevna on this side, though with a loss of 3000 men in the process. By 5.30 P.M. they had driven the Turks out of the other one also. The latter attempted a counter-attack, but it was unsuccessful, so the works remained in the hands of the Russians for the night. Skobelev's position was, however, extremely critical. It will be seen from the map that he had thrust his force forward like a wedge into the heart of the Turkish position, the defenders having intact works in rear of him on both sides.

In the morning the Turks made several assaults on the Russian troops in the captured redoubts, both from

the Krishin redoubts in their left rear and from Plevna in their front, but they were unsuccessful. A heavy fire of artillery and musketry was directed on them, and at 2 P.M. a caisson of ammunition was blown up in one of them. The position of the Russians had now become desperate, for no reinforcements could possibly be brought up to them. Soon after three, the Turks, having collected a great force, made a determined assault from several points, which resulted in the Russians being forced to quit. The total losses of Skobelev's force had amounted to 160 officers and over 8000 men. So ended in failure the operations on the south side, which brought to a close the third of the great Russian attacks on Plevna. The only success achieved by the attackers had been the capture of Grivitza No. 1 Redoubt by the Roumanians.

A few days later an attempt was made by the Roumanians from Grivitza No. 1 to capture No. 2 Redoubt to the north of it, but was repulsed with loss. The total losses of the Russians and Roumanians during the third battle of Plevna amounted to 365 officers and over 18,000 men.

That this disastrous result was partly due, as in the former battles, to the defective tactical handling of the Russian attacks cannot be denied. It has already been noticed how in the eastern and south-eastern attacks the columns were sent forward in succession, each one just after the one before it had been overwhelmed. But this alone would not account for the failures, or for the enormous losses suffered. For instance, Skobelev's attacks on the 11th, which were well delivered and well supported, were only successful at an enormous sacrifice of life. It is clearly evident that the real cause was the enormously increased defensive power conferred by the breech-load-

ing rifle. Against unshaken troops in good entrenchments, armed with this weapon, direct frontal assaults had become well-nigh impossible, at all events in the formations which were customary previous to that date.

The following is a description of the Turkish fire tactics by an Englishman who occupied the position of a company officer in the Turkish infantry throughout this great siege, and who therefore had unexampled opportunities of witnessing their method and its effects.¹

“Before finishing with the third battle of Plevna, I must draw attention to that feature of the Turkish tactics which stamped the war of 1877 with a character of its own, a feature evident in all actions in which I took part, in none more than in the one under discussion; I refer to the quick-fire of the Turkish infantry, of such power, duration, and effect as had never been dreamt of. General Todleben wrote later: ‘Such a shower of lead as that with which the Turks hailed our troops had never been employed as a mode of warfare by any European army.’ It was more instinct, experience, silent consent, and confidence in their weapons, than training or formulated rules, which induced the Turkish foot-soldier to adopt this mode of fighting. I had witnessed quick-fire drill in Widdin, but I venture to say that it was not till after the first battle that the officers became really conscious of the terrific power of long-sustained quick-fire. Our orders were briefly as follows: ‘As soon as you know or suppose the enemy to be within range of your rifles, cover the space presumably occupied by him, or presumably to be traversed by him, with quick-fire, independent of distance, duration, difficulty of aim, probability of hitting, and consumption

¹ W. V. Herbert, “Defence of Plevna.”

of cartridges.' The awful effect upon the opponent of this rule, if carried out literally and as much *con amore* as it was by the Turks, is apparent in the Russian losses,¹ and in the fact that throughout the Plevna campaign the Russian attacks, with few and unimportant exceptions, collapsed, numerical superiority notwithstanding. The Turkish consumption of cartridges was in proportion. On the 11th and 12th September it reached in the Grivitza, South-Eastern, and Krishin redoubts 300 per man per day; in Baghlarbashi some of the men had exhausted their complement of 500 cartridges in six hours' fighting. To carry on this mode of warfare the organisation of the cartridge supply must be as perfect as it was in Plevna camp. Not only had we an immense central stock housed in a mosque, which was replenished from Orkanye at regular intervals, but each redoubt had its own reserve store, each battalion its mobile stock, each trench its numerous boxes placed in convenient positions for the men to help themselves freely. There was a service of pack-horses, by means of which the stock of any redoubt or battalion could be replenished from the central store at a moment's notice. These arrangements worked without a hitch, even in the confusion of a partly unsuccessful general engagement."

We should remember when reading this that the above was written of the single-loading, not of the magazine rifle.

After the third battle of Plevna the Russians decided to venture on no more assaults, but to undertake a strict investment of the place with a view to its reduction by starvation. For this purpose considerable reinforcements were brought up, and the famous Todleben, the hero of

¹ This bears a remarkable resemblance to the Boer methods in their defensive battles in South Africa.

Sebastopol, was called to the councils of the Russian leaders.

The Turks, however, continued to receive reinforcements and large convoys of supplies until the 24th October, when the successful operation of the Russian corps under General Gourko, beginning with the capture of Gorna Dubnik on the west of Plevna, permanently severed the Turkish line of communication and completed the circle of investment. The strength of the Turkish army inside Plevna at this time was about 40,000 men and 88 guns, while that of the Russians numbered over 110,000 men with 500 guns. The latter proceeded to fortify their lines of investment, which extended over a length of forty-six miles, as strongly as possible, by erecting batteries, establishing redoubts on important points, and pushing forward trenches as near as possible to those of the Turks, in order to protect their batteries from the musketry fire of the latter. Roads and bridges were constructed connecting these positions, telegraphic communication provided, and "all the necessary measures taken to receive the enemy in case of a sortie, with the greatest possible number of troops concentrated immediately upon the spot that he should choose as a point of attack."¹ Such were the masterly dispositions of Todleben, who was determined not to attempt any more costly assaults, but to trust to the slower but absolutely certain process of blockade.²

The inevitable end came in a little over six weeks; by the beginning of December provisions, clothing, and every kind of necessary, except ammunition, had become exhausted, and all hope of relief had departed. But Osman Pasha was not the man to tamely surrender even

¹ Extract from Todleben's despatch. Green, "The Russian Army and its Campaigns in Turkey in 1877-78."

² Compare the similar German tactics at Metz and Paris.

under these circumstances. It was decided to make a supreme effort to break out through the Russian lines of investment on the west side of the town. The 10th December was the day fixed for the enterprise. At daybreak the Turkish divisions crossed the Vid and delivered a most impetuous, daring assault upon the Russian trenches which faced them. Several hours of desperate fighting ensued, and the first line of entrenchments was carried. But Todleben's skilful dispositions rendered the effort unavailing; and strong reinforcements converged on the threatened point. The second line resisted the utmost efforts of the assailants; the Russians counter-attacked in force; the Turks gave way; their gallant leader himself was wounded, and in disorderly retreat their columns recrossed the river, where they, together with the enormous train of waggons, carts, &c., containing the civilian inhabitants of Plevna, were subjected to an appalling hail of projectiles from the Russian artillery. All hope of success being lost, Osman Pasha was obliged to surrender unconditionally, and his army became prisoners of war.

So ended the most brilliant defence of the nineteenth century next to that of Sebastopol. Of the lessons conveyed by the operations round Plevna it is unnecessary to say more, as they have been sufficiently adverted to in the course of the narrative. The following extract from Todleben's report on the siege is useful as summarising the causes of the successful nature of the defence made.

"The army of Osman Pasha occupied under the walls of Plevna an entrenched camp very easy to defend, and presenting several lines of formidable positions, which the enemy, during our long sojourn in front of Plevna since the end of July, had rendered still stronger by

making use of all the advantages of the ground, and in adapting his sapping operations skilfully to them. The strength of resistance of these works became all the greater, thanks to the violent fire of quick-loading guns and to the mass of cartridges which the enemy had at his disposal, which enabled him to cover the ground in front of his works as far as a distance of two versts with a hail of lead. Besides this, the positions of the enemy, by their width and depth, enabled him to keep his reserves out of range of our artillery. Finally, all the ravines came together near the town itself, which allowed the Turkish reserves, in case of an attack on our part, to come immediately to the threatened point. These conditions, so disadvantageous for us, explain in great part the insuccess of the assaults of the 11th and 12th September against the positions of Plevna, and the decision taken, in order not to shed blood uselessly, to attempt no more to gain possession of them by open assault, but to await the arrival of reinforcements and proceed to the investment of the Turkish army.”¹

The actual works constructed by the Turks were of the simplest possible nature. None of the superficial technicalities of theorists were attended to in the least degree. The trace of the redoubts was as a rule square, of some 50 yards wide. There was no attempt at flanking of ditches, nor, as a rule, were adjacent works so situated that they mutually flanked each other's fronts. The Turks instinctively recognised that with the breech-loading rifle the chief necessity is to be able to deliver a powerful frontal fire, and their arrangement of musketry trenches on the wings of, and between the main works permitted of the full development of this. The works were not always, as might have been expected, placed

¹ Green, "The Russian Army and its Campaigns in Turkey in 1877-78."

on the forward crests of hills so as to be able to see down the front slopes, but were often kept back on the rear crests. This arrangement enabled strong reserves to be kept under cover of the reverse slopes in rear, while the comparatively short distance required to repulse an attack made the existence of hidden ground a little way to the front a matter of small moment. In all the works overhead cover was provided, in which the defenders could sit secure from artillery fire, and from which they could man the parapets to repel an assault in the shortest possible time. Of obstacles there were none, as materials were not available, nor did the ditches of the redoubts present any of a serious nature; in fact, entire reliance was placed on the deadly hail of bullets which could be brought to bear on the attackers.

It will thus be seen that the Plevna works amply fulfilled the essential conditions stated in Chapter III. of this book to be necessary for all defensive works. They afforded the utmost scope for the use of the defenders' weapons, and the Turks by a correct instinct recognised that the rifle is the weapon *par excellence* of the defence. They restricted the scope of the attackers' weapons by the form and material in which they were constructed, and by the existence of overhead cover. For the rest, good communications, good tactical organisation, good arrangements for supply, plenty of ammunition, and stout hearts were the factors on which Osman Pasha relied, and with effect, in this brilliant and memorable defence.

CHAPTER X

OPERATIONS IN AMERICAN WAR — FORT FISHER — VICKSBURG —
INCREASING POWER OF ARTILLERY IN THE EIGHTIES — LONG
BREECH-LOADING GUNS — ALEXANDRIA — EFFECTIVENESS OF
EARTHWORKS — TWYDALL REDOUBT — OPPOSING OPINIONS ON
THE SUBJECT OF FORTIFICATION — MAJOR CLARKE'S WRITINGS
— METHODS PROPOSED FOR DEFENCE OF A POSITION

THE defence operations which have been described in the preceding chapters are far from exhausting the list of such events from which instructive lessons could be drawn. For instance, any history of the sieges of the nineteenth century would be incomplete without an account of those which took place in the American Civil War. But, as has been stated before, this is not intended to be a history of siege warfare; a few examples only of the sieges of the principal European campaigns have been selected to illustrate the principles of the defensive art, and to exhibit the effect of the weapons employed by both sides. A few remarks, however, on one or two of the principal American sieges will not be out of place here, though in point of sequence they took place before the Franco-German and Plevna campaigns which have already been dealt with.

The lessons of the American Civil War are very similar to those which have been obtained from the other campaigns which have already been described. Again we find exemplified the small effect even of heavy artillery fire against earthworks, and the efficacy

of the breech-loading rifle in the hands of the defenders in repelling attack.

One of the most striking examples of the former is the case of Fort Fisher. This work, which was a provisional redoubt constructed in sand, but containing good bombproof cover for the garrison, was, on the 24th December 1864, subjected to a most severe bombardment from the heavy guns of the United States fleet of thirty-three vessels. The average rate of projectiles delivered into the work is stated to have been 115 per minute. On the following day the bombardment was continued for seven hours, and then a large force of soldiers was landed for the purpose of making an assault, during the course of which the bombardment was kept up. The assault, however, was repulsed, and, as the work was then reported to be "substantially uninjured as a defensive work," the troops were re-embarked and the fleet drew off. It is true that the failure of the attack, or rather the premature withdrawal, has been stated to be due to the irresolution of the commander, but, even if it were so, this would not explain away the insignificant effect of the bombardment. At the second attack in January 1865 an even more severe bombardment from a greater number of ships was kept up for nearly three days. On the evening of the third day two assaults were delivered, one by a landing party of 2000 seamen and marines on the sea front, and the other on the land front by the Northern army. The former was repulsed with heavy loss, but the latter succeeded in getting in by surprise, and the place fell.

Vicksburg, which sustained a siege of 213 days, was defended by a chain of field-works, of irregular trace and open at the gorge, connected by musketry trenches. The works suffered heavy bombardments, both from the

land artillery and from the Northern vessels in the Mississippi. They were three times assaulted in force—the last time by 30,000 men—and all the assaults were repulsed with heavy loss. A regular siege was then undertaken, and parallels and approaches carried forward to the vicinity of the works. Provisions and ammunition having by this time become exhausted, the place fell.

Lots of similar examples could be given, but they are unnecessary. The above show us, as was afterwards strikingly confirmed at Plevna, that, given the existence of cover for the defenders from the artillery fire of the besiegers, and means of manning the parapets before the assault, the frontal fire of the breech-loading rifle was even then sufficient to arrest the most determined attack. Also that earthworks had at that time little to fear from artillery fire, even of rifled guns. Fort Fisher incidentally indicates the great value of sand as a means of resistance to shell fire; this was afterwards confirmed at the bombardment of Alexandria in 1882, and is now a well-established principle.

From a general survey of the operations described in the previous chapters one fact becomes strikingly apparent; that is, that the most successful and notable defences have been of places where the works were of a provisional character, hastily thrown up in the presence of the enemy, or in immediate anticipation of attack, as, for instance, Torres Vedras, Sebastopol, and Plevna; while places with elaborate permanent fortifications have almost invariably played a less creditable part.

It would be rash, however, to conclude from this that permanent defences are prejudicial or are unnecessary. It should be remembered that the defences of the places named above enjoyed the advantage of having been designed and organised by soldiers of a

high order of military genius, at the same time and in accordance with the conditions under which they were required. The permanent works, on the other hand, were designed many years previously, to meet conditions of a date anterior to that in which they had to stand their active test, and their designers were persons of whose fitness for their task we have no guarantee, and who, at any rate, we know to have been inferior in military ability to Wellington, Todleben, and Osman Pasha. In fact the permanent defences were designed to a considerable extent by the light of theory, while the other ones were designed by practical soldiers by the light of experience of war. It is therefore easy to understand that the latter conformed more nearly to the tactical needs of the day.

There is no reason why permanent defences should not be designed on the same *principles* as those of Torres Vedras or Plevna, though adapted to the changed conditions of their own day. They would then achieve equally successful results with far less loss of life and hardship to the defenders. An endeavour will be made later to show how this may be done.

It is unfortunate, however, that in the great burst of fort-building which supervened in the sixties and seventies, the lessons of the Crimean and American campaigns were very imperfectly recognised. Notwithstanding that the great effect of rifled ordnance against vertical masonry scarps, and its want of effect against earthworks, had been clearly proved, and the power of frontal fire of the breech-loading rifle had been made abundantly manifest, yet we find that many of the works erected at this period took the form of great, conspicuous, elaborate forts, with deep ditches and high escarps, flanked by enormous caponiers giving two or three tiers

of fire—all carried out at immense cost. Even after the example of Plevna had displayed in a strong light the fact that the frontal fire of the breech-loading rifle alone was sufficient to resist the most determined assault, do we find shown the same inability to depart from pre-conceived ideas. Forts with vertical escarps and flanked ditches continued to be designed for several years subsequently.

In the years that followed Plevna the power of artillery advanced with great rapidity. The long breech-loading gun was invented, and its high-muzzle velocity, flat trajectory, and increased accuracy, made it a great advance on its predecessors. Conspicuous works of the old type, with exposed revetments and steep slopes, would, it was seen, become an easy prey to it, and the flat trajectory made its shrapnel fire extremely effective against troops in the open.

In consequence of the great results expected from this form of weapon an impression grew up in certain quarters that the only means of obtaining security against it lay in greatly increasing the massiveness of works, that is, in greater thickness of cover in bombproofs, in thicker parapets and revetments, and in putting the guns of the defence behind armour or in turtle-backed steel cupolas, raised and traversed by machinery.

It was chiefly on the Continent that these ideas were largely held and were put into practice, though they were not without advocates in this country also. But about this time there were visible in England hopeful signs of a truer appreciation of the teaching of history. The lessons of the bombardment of Alexandria had made a considerable impression on thoughtful minds, and the valuable series of experiments carried out at Lydd pointed to conclusions very different to those stated

above. It became evident that the effect on earthworks of the new artillery was not appreciably greater than that of the older types. Indeed, in some respects it was less. On flat slopes, particularly in light or sandy soils, the very qualities from which it derived its power, proved its bane. The flat trajectory and high velocity, so effective against walls or steep slopes or troops in the open, caused the projectiles to glance off flat slopes and explode harmlessly in the air. Even when the explosion of a large charge directly on the earth slope could be obtained, it was found, if the soil was of a light nature, to do very little damage.

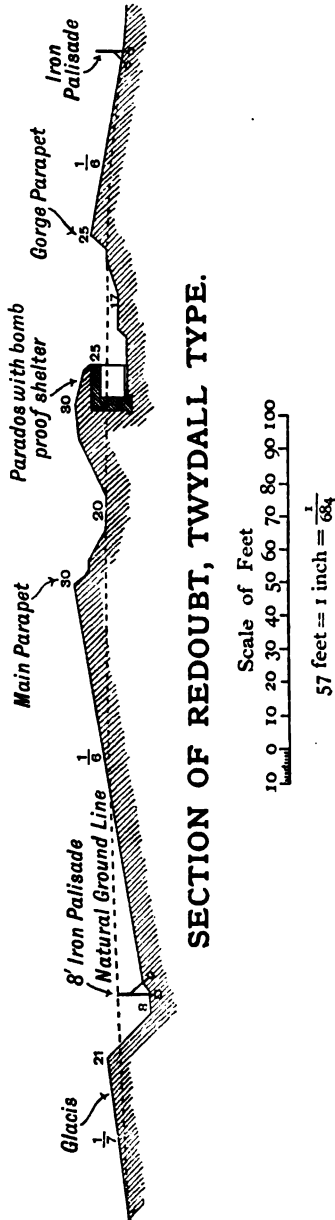
It was also realised that the increased accuracy at long ranges of the new weapon was not, under certain circumstances, a factor of such overwhelming importance after all, since the chance of obtaining effective hits depends as much on the possibility of properly seeing and laying on the object and of observing the fire, as on the accuracy of the weapon. Earthworks, therefore, of low command, with gentle slopes harmoniously blended into the natural features of the ground, were found to confer a double security, by reason of the difficulty in hitting them, and of the small effect of hits when obtained, from high velocity flat trajectory guns.

To illustrate the above principles a small redoubt was constructed in 1886 at Twydall, near Chatham. The superior slope of its parapet, which was at an inclination of one in six with the horizontal, was produced straight down to the bottom of the ditch, where there was a line of eight-foot steel-spiked palisading. The latter was covered by a sloping earth counterscarp. The trace was of the simplest character, and the defence of the obstacle in the ditch was entrusted entirely to frontal fire from the parapet, an arrangement for which

ample warrant could be found in the teachings of past warfare. The work was for occupation by infantry only, and bombproof accommodation was provided for the whole garrison under a parados situated parallel to and in rear of the parapet; passages and steps were provided so as to permit of the parapets being manned at the shortest possible notice.

This work fulfilled in a high degree the conditions set forth above. At a short distance it was completely indistinguishable from the surrounding fields, and subsequent experiments on works of similar design proved that it was practically impossible to do them any serious damage, even with siege-guns.

There is another point in regard to this work which requires notice, as being illustrative of the trend of English military opinion at that time. It has been stated that the Twydall redoubt was intended for infantry only. This was contrary to the previous custom, both of the English and



Continental nations, which was to make redoubts places both for guns and infantry. In England, however, the conclusion had been arrived at that the time had come to remove the guns from the infantry redoubts, and place them in independent batteries outside, in such positions that they would be defended from assault by musketry fire from the infantry works. There were several good reasons for this change. A site which is suitable for an infantry position may be unsuitable for guns, and *vice versa*. The presence of guns in a work manned by infantry draws on the latter the fire directed at silencing the former, whereas, if the guns are in independent positions outside the infantry redoubts, the latter will probably not be troubled by artillery fire till after the defenders' guns have been silenced, or at all events the attackers will be obliged to divide their attention between the separate positions of the two arms instead of being able to concentrate it on one work. Again, it conduces to the better control of the artillery to have them in a separate battery than for them to be mixed up with infantry in crowded and cramped redoubts. The gun positions can be rendered less conspicuous, and more freedom in selecting positions for them is obtainable by this means; lastly, out of open batteries it is possible to move the pieces with a rapidity which the passages and turnings of an infantry redoubt forbid, and the tactical possibilities opened up by the power of having a portion of the defence artillery mobile are very great indeed.

These views, however, were combated in many quarters, particularly in certain countries on the Continent, where the use of the old type detached forts, mounting heavy guns in fixed positions, and also containing large infantry garrisons, continued to be favoured.

The principle, too, of relying on earthworks of gentle slopes as protection against artillery fire found many opponents. There was a large school of military opinion, the chief exponent of which was General Brialmont of the Belgian Engineers, who advocated, as the only form of protection against the great and increasing power of modern artillery, the extensive adoption of armour, the putting of the guns of the defence into steel cupolas, great increases in the thickness of the concrete coverings to casemates, magazines, &c., and in the strength of escarp walls, &c., while they retained the steep slopes, deep ditches, high escarps, elaborate flanking arrangements, caponiers, &c., of the old types, on the ground that they were still necessary as obstacles to assault, and to give *moral* to the garrisons.

The arguments of this school were strengthened by two great changes which took place in artillery material in the latter half of the eighties and the early nineties. These were the introduction of high explosive shell, and the rehabilitation of the howitzer or mortar. The indirect firing armament of old days had always suffered from a distressing lack of accuracy which greatly reduced its effective scope. But the modern rifled breech-loading howitzer does not suffer from this defect, and the power conferred by its possession, namely, that of delivering an accurate fire of heavy projectiles with a large angle of descent, is one of considerable value. When also the projectiles thus delivered are filled with high explosive, it would certainly seem as if a new factor had arisen in the science of siege warfare.

But if one might judge by the writings of a certain school it might be believed that nothing less than an entire revolution in the principles of the defensive art had come to pass. So great was the destructive effect

anticipated from the new projectile that the ordinary types of works and methods of defence were said to be doomed. Mere earthworks would be rapidly reduced to formless ruins, their ineffective casemates pierced and their garrisons destroyed. Guns in open emplacements would be dismounted at once—nothing could live under the awful effects of the high explosive shells. Some even averred that the day of the defensive had passed away for ever; at all events it was agreed (only among a certain class, be it understood) that the attack had acquired further and most preponderating advantages from the improved ordnance.

Desperate remedies were considered necessary for this desperate case. Forts were to be huge blocks of concrete, threaded by underground passages and chambers, and studded with guns in steel cupolas. Mechanism was to be employed on an immense scale in the working of these cupolas and the guns in them; and the mechanic would in consequence to a large extent take the place of the soldier. As the attackers' high-angle artillery would in future be able to continue dropping their projectiles over the heads of their advancing infantry into the defenders' works up to the last stages of the attack, it was considered by this school more necessary than ever to retain the deep ditches, elaborate caponiers, and other flanking expedients of a bygone age.

It is not proposed to describe in detail any of the methods of fortification devised by the advocates of the steel and concrete party, as it is not considered that they are of a very illuminating nature as regards the principles of the defensive art. The outcomes of pure theory, unsupported by the experience of war, very seldom are. It is not even proposed to give detailed

descriptions or illustrations of any of the various forms of revolving or disappearing steel cupolas which have found so much favour on the Continent. Their principal interest to English soldiers is correctly stated in the text-book of Military Engineering, Vol. I. (Part II.), where they are described and illustrated on the grounds that, as some foreign nations have adopted them, they become of interest as possible targets.

The extreme views alluded to above were but faintly echoed on this side of the Channel, where, in fact, about this time there arose a champion of the cause of common sense as against dogma, of the teaching of the past as against the visionary flights of theory. In 1890 Major Sydenham Clarke, Royal Engineers,¹ published a book entitled "Fortification: Its Past Achievements, Recent Developments, and Future Progress," in which the arguments and conclusions of the theorists were criticised with ruthless logic and a refreshing vigour. In this work, in which the subject was treated on broad military principles, based on the lessons of past siege warfare, it was shown that the improvement in weapons, if they affected in any way the balance of power between the attack and the defence, were on the whole favourable to the latter rather than the former, provided, of course, that the design and organisation of the defences were based on sound tactical principles.

For instance, the increased accuracy of high-angle fire should be a distinct gain to the defenders, who could and should have all their indirect fire batteries so screened from view as to be impossible to hit except by chance shots, who should also have accurate data as to the ranges of all the possible positions for the besiegers' artillery, and whose observing arrangements

¹ Now Colonel Sir George Clarke, K.C.M.G., Governor of Victoria.

and telephonic communications should all have been perfected and practised in peace time. As regards the reputed great effect of the high explosive shell, it is evident that if it is, as alleged, so difficult for the defenders to find protection against it, it must be considerably more so for the besiegers, whose works are hastily thrown up with scanty materials and resources. In regard to this question, however, Major Clarke pointed out that the Lydd experiments had shown that high explosive shell gave no increase of results against earth-works, though they produce great destructive effect against masonry.

Major Clarke also laid great stress on the very great increase of power conferred on the defence by the introduction of the magazine rifle and of smokeless powder, both of which were only in the early stages of their inception when his book was written. These new factors, indeed, have a far more important bearing on defensive tactics than all the improvements in ordnance put together. Major Clarke also in trenchant language demonstrated the futility of the many technical details which were still counted as essential by the theorists of the Continental school. Continuous enceintes round towns, keeps or reduits in forts, ditches, caponiers, &c., should in his opinion be consigned to the limbo of the past. His book forms, indeed, a powerful piece of destructive criticism, directed both against the old dogmas and the "new ironmongery."

If it were no more than this it would be of high value in indicating what are essentials and what are mere superficialities, and in teaching the student to reason for himself instead of blindly accepting ancient formulæ. But it also contains an able exposition of the broad principles which should govern the design of a defensive

position, and suggestions as to the best methods of putting these principles into practice.

It will be advantageous to describe here Major Clarke's idea of the method of defending a position as it may be said to be representative of the English school of opinion on this subject. Tactical considerations form the basis and foundation of it, and we may fitly begin by quoting his summary of the essential requirements of proper defences. It is as follows: "Organisation, capable commanders, efficient armaments, adequate supplies, matured preparations, well-arranged communications—these things constitute the essence of the defence; these determine the resisting power of Land Fortification. Within broad limits the details of design are of relatively small account."

No one who has studied the siege operations which have been described in the previous chapters of the present book can fail to be convinced of the truth of the above statement. In every case where these conditions prevailed, glorious and protracted resistances were achieved, and where they were wanting the results were unsatisfactory.

A defensive position, according to Major Clarke, should comprise strong permanent redoubts for infantry and machine guns, on the important tactical points, with powerful artillery in independent batteries outside them, this combination being supplemented by a field force which would carry out the outpost duties and man field defences guarding the intervals of the permanent works. "Thus, unless siege trains are doubled, the artillery combat must be entirely divorced from the attack of the infantry positions, and the besieger, assuming him to have silenced the guns of the defence, will then have to recommence action against the redoubts. The latter

alone, in conjunction with the field defence of the intervals, will amply suffice to render the position incapable of being taken by assault.

“The assumption involved is that a position held by strong permanent redoubts, supplemented by field defences, can now fully guarantee the safety of the guns, which, therefore, can be allowed a freedom of action and of choice of site hitherto denied them. This assumption appears to be abundantly justified by the experience of war.”

The distance apart of these infantry redoubts would, of course, depend principally on the conformation of the ground, as there would always be certain positions which, from their tactical importance, must be occupied; but other things being equal, the interval suggested by Major Clarke as being the most suitable, is about 2500 yards.¹ “In choosing sites for the redoubts, all idea of securing good artillery positions should be abandoned, the object being merely to select points where purely infantry keeps would be most advantageously posted. An extended field of fire in front of the redoubts is not essential, and in many cases the sites might, as at Plevna, be drawn back from the brow of a hill. Provided that the slopes in front can be well observed from some other portion of the line of defence, the artillery will effectually take charge of it, even in the event of a formal attack.”

“The artillery of the defence should be entirely movable, with the exception of a proportion of heavy howitzers or mortars constituting the only permanently mounted armament. It should be sought to overpower or exhaust the artillery of the besieger by superior mobility, better observation and range-finding, more highly matured organisation, and greater power of tactical sur-

¹ It must be remembered that this was written in 1890, namely, in the days of the Martini-Henry rifle.

prise, rather than by superiority of shell power. At the same time full advantage should be taken of the possibility of employing a few heavy, permanently mounted howitzers or mortars in concealed positions."

"The guns of the defence having been freed from their ill-assorted union with the detached fort, it becomes possible to select the artillery positions with considerable latitude of judgment. For the direct fire section of the armament, visual conditions and conformity to the general line of defence adopted impose certain limitations of site, but leave a wide margin of choice. On the other hand, for the indirect fire armament, observing stations which can be held to the last are a main necessity, and there remains a still wider field of selection—more especially since the fortress can employ captive balloons without difficulty."

Good road communications are necessary connecting all the redoubts and batteries with each other and with the interior of the fortress, that is, with the headquarters and main supply and ammunition depots. Railway lines, duplicating the principal roads, should be added when the ground allows. A ceinture railway acting as a continuous artillery position for guns mounted on trucks is recommended by Major Clarke as an ideal arrangement, but frequently impracticable. There are also difficulties in the way of designing a suitable truck and mounting for this arrangement.¹ In any case the use of railways to transport guns from one part of the line to another is recommended, but if railways cannot be employed, all the communications, both radial and circumferential, must be by road, and the guns must be transported on travelling carriages.

¹ These difficulties were overcome in South Africa, and mountings constructed permitting of guns being fired from trucks.

“The main principles guiding the artillery arrangements should thus be a liberal provision of alternative emplacements both for the heavy movable armament mounted on high carriages and also for field guns. The main security of the fortress artillery must be sought in invisibility and change of position. The road or railway following the general line of the artillery position should be sunk sufficiently to conceal all movements completely. A thick hedge will materially assist in securing invisibility. . . . The more important emplacements and the communications should be made as part of the permanent defences of the fortress, and the lines of hedge should be planted. The artillery platforms should be kept in store to be laid when required, but holdfasts should be fixed. In addition to the gun positions thus provided for, the defence should be prepared to make a large use of temporary emplacements in the event of attack. Such emplacements would be of siege type, but would have the great advantage of permanent communications, and in some cases, of a covering mass ready to hand.

“The result of this treatment of fortress artillery must be to transfer to the besieger some of that bewilderment which has hitherto been the prerogative of the defender. As the artillery positions need rarely be fully completed until the fortress is prepared for defence, the besiegers will be unable to commence operations with any definite plan of action. The forts, the usual objectives, will be so no longer. It will need a vast expenditure of ammunition to injure them, and if the siege batteries are laid out with this object, the fortress artillery will find the game their own.”

With regard to the infantry redoubts in a fortress of this nature, it is stated that they should be of the

simplest form, compatible with fulfilment of the following conditions :—

- (a) Full development of rifle and machine-gun fire.
- (b) An efficient obstacle.
- (c) Shelter for the whole garrison ; such shelter implying protection against the heaviest projectile capable of being fired from siege ordnance, but not contemplating the fall of successive shells on the same spot.
- (d) Unimpeded interior communication, allowing the garrison to man the works in the shortest time.
- (e) Invisibility.

A description has already been given of the Twydall redoubt, in which the above conditions were to a great degree fulfilled. In trace such redoubts should be as simple as possible, but they should be shallow in plan, in order to reduce as much as possible the chances of being hit. It is evident that with low trajectory high velocity guns a very slight error in elevation will cause a considerable difference in the range attained, and the rectangle of hits with such weapons is always very long in proportion to its width ; the advantage of a shallow form of work is most manifest. But objections have been raised to this on the grounds that shallow works have short flanks, and this may be a source of weakness in the event of an attack on the flanks from a position in the intervals between the redoubts. The danger from this has, however, probably been considerably exaggerated. A redoubt which forms one of a chain or girdle of such works could only be attacked on the flank by a force which was operating in the intervals between it and the neighbouring work, and this would be impossible if the latter was still held by the defenders and the interval

was further strengthened by field works. In any case, assuming the neighbouring redoubt to have been captured, and that such a form of attack was possible, the best means of guarding against it would be by accessory musketry trenches outside the work, rather than by lengthening the flank, and thus rendering it liable to enfilade. The importance of shallowness in the work is paramount.

Simplicity of trace also makes for the full development of rifle and machine-gun fire, a condition which also precludes traverses or other structures on the parapets. Major Clarke, however, recommended the employment of mobile field guns in the flanks of the redoubts. For the obstacle either a sunk unclimbable fence or a strong wire entanglement (or both) might be used, but whatever it is it should be screened from the attackers' view and fire by a glacis.

The invisibility of the redoubts, which is particularly insisted on, can be secured by a low command and by rejecting smooth turfed slopes, also by arranging the slopes of the flanks of the works, so that when seen from the front they blend into the surrounding ground. If no natural background can be obtained, the planting of a belt of trees at a short distance in rear of the works is recommended.

The foregoing is a summary of the principles advocated by Major Clarke for the defence of a position, and these principles were generally adopted in England from that time. Upon a careful consideration it will be seen that they accord well with the teaching conveyed by a study of the siege operations which have been described in the previous chapters of the present work, particularly of these of Torres Vedras and Plevna. Tactical action is amply provided for, and is, in fact, accorded that

predominating position which previous experience shows us to be necessary. Full scope for the use of the defenders' weapons is arranged for by the nature and situation of the redoubts and batteries, while the effect of those of the attackers is restricted by the use of earth and gentle slopes as the principal means of protection, by concealment as far as possible of the works, and by mobility of the armament and garrisons, that is to say, by the power of rapidly withdrawing them from dangerous positions, or concentrating them on those where a decisive effect may be obtained.

The views of Major Clarke and the English school of engineers were not generally accepted on the Continent, though they received even there the approval of many practical soldiers. Those writers who had felt the lash of his caustic pen were naturally little likely to express themselves as converted, and, in fact, retorted somewhat briskly. It is unnecessary to go into their arguments, but generally speaking they held that, with the improved ordnance, mere earthworks would be untenable, and guns in open emplacements would be overwhelmed at once. In the material protection of iron and concrete only was salvation.

When views so widely divergent are held and are supported by each party's ideas of the teaching of past history, the only means of discovering which, if either, of the views is correct is to await the test of the next great war. Which of the two theories was borne out by the events of the war in South Africa will be discussed in another chapter.

CHAPTER XI

CHANGES IN THE LAST TEN YEARS OF NINETEENTH CENTURY—
HIGH EXPLOSIVE SHELL—SMOKELESS POWDER—SOUTH AFRICA
—GREAT EFFECT OF MAGAZINE RIFLE FIRE—COMPARATIVELY
SMALL EFFECT OF ARTILLERY FIRE—BOER FORMS OF DE-
FENCE WORKS—CONCEALMENT—TACTICAL METHODS—MO-
BILITY—TACTICAL DISADVANTAGE OF THE ATTACK IN THE
PRESENT DAY—BRITISH DEFENCE OPERATIONS—MAFEKING—
ASSAULTS—COUNTER-ATTACKS—NEW FORMS OF ORDNANCE—
MOBILITY OF HEAVY GUNS AND HOWITZERS—PRINCIPAL
LESSONS TO BE LEARNT—PROBABLE METHODS OF ATTACK IN
THE FUTURE

THE last ten years of the nineteenth century witnessed certain changes in warlike weapons which were destined to have a more marked effect upon all forms of tactics than any that had taken place since the invention of breech-loading arms. The changes particularly referred to are the introduction of magazine rifles and smokeless powder. There had been, up till the occurrence of the war in South Africa, a tendency to give a far greater prominence to the tactical effects produced by the improvements in artillery material than to those of the improvements in small-arms; but practical experience has now changed that, and, though it cannot be denied that tactical methods, both on the side of the attack and of the defence, have undergone modifications by reason of the new artillery inventions, yet it has become certain that at the present stage of the development of the two classes of weapons, the rifle is the one which exercises

the more paramount influence upon warfare in general, and the defence in particular.

We have already seen how at Plevna, where the rifles were only single-loading, the terrific effect of the quick-fire of the Turkish infantry made the Russian attacking columns fall back in disorder, and caused them appalling loss. It must be remembered, however, that the Russian attacks were made in somewhat dense formations, and also that their artillery was distinctly inferior in quality (though not in numbers) to that of the Turks, so that its effect on the defenders' infantry was very slight, and the latter were uninjured in *moral* when they received the attack. This siege, at all events, proved that frontal attacks against unshaken infantry in position had become practically impossible.

The introduction of the magazine rifle would evidently still further increase the power of infantry on the defensive, but the idea was generally entertained that this would be at least partially neutralised by the increased power of artillery, particularly the high explosive shell, which would inflict such loss, and so shake the *moral* of the defenders that frontal attacks would still be feasible. The fact is that the tactical methods which have been taught in the British army of late years have been based almost entirely on the teaching of the Franco-German war, in which the well-handled German artillery established a superiority over the French infantry, and were able to effectively shake their *moral*. The teaching of Plevna, though it took place seven years later, has been somewhat overlooked. It is true that in Major Clarke's book, referred to in the last chapter, the Plevna lesson of the power of the rifle was thoroughly inculcated, but this book was not alone sufficient to counterbalance the official tactical teaching which was based on the German

system. It was, moreover, written before the magazine rifle had been brought into use.

The general idea in England just before the late war, as regards the attack of defensive works, was this: The prospect of materially damaging earthworks by direct fire was recognised to be very slight; but it was proposed to prevent the defenders from manning the parapets during an attack, except during the very last stage, by means of accurate shrapnel fire. Also it was proposed to cause great losses to troops under cover behind parapets by means of high explosive shell from field howitzers, as the all-round effect or "back-blast" of this form of explosive would be effective in such a case. It was believed that if a fire of this nature could be kept up till the attacking infantry had got so close to the work as to mask their own artillery fire, the defenders would have suffered so much in *moral* as to be unable to repel the rush of the assault. It was, of course, assumed that the defenders' artillery had been squashed in an early stage of the combat, though what inherent inferiority the defending artillery was supposed to suffer from as to make its overthrow by that of the attackers a matter of certainty is not clear, unless it is assumed to be so because in the Franco-German War the German artillery, which generally attacked, was superior to that of the French. It does not, however, follow that this condition will be always repeated. It is evident, moreover, that this process of supporting an infantry attack by artillery fire is a good deal dependent on the accuracy of the latter, which against well-concealed works of the nature advocated by Major Clarke, might not be easy to secure.

What happened in South Africa? Take the familiar case of Colenso. Here the Boer defenders were in

simple rough trenches; there was no steel or concrete protection for their guns; there was not even overhead cover for the men. The British artillery consisted of two 4.7-inch quick-firing guns, ten naval 12-pounder quick-firing guns, and thirty field guns. Here, it would be thought, was an opportunity to put in practice the operation just described for preparing the way for an attack. The attempt was indeed made.

“All visible defences had been heavily shelled by eight naval guns on the 13th and 14th, but though some of the defences were damaged, and accurate ranges obtained, we failed to induce the enemy to disclose his own position or reply to our fire.”¹ On the 15th, at daybreak, the attack took place, and was opened by a heavy bombardment of the Boer position by the field artillery and naval guns, the latter firing lyddite shell and the former shrapnel. This cannonade was received with silence, hardly a shot was fired in reply, and not a Boer was seen anywhere. Very soon the infantry were sent forward in extended order to the attack. We know what happened then; how as soon as the infantry came within range an appalling musketry fire was commenced from the Boer trenches. Smokeless powder being used it was impossible to locate from whence it came, though it became evident that some of it was directed from points which had not before been known to be occupied. It is needless to go into the familiar details of how the field guns were overwhelmed by a tempest from invisible trenches; how the infantry, bravely struggling on under heavy losses, were unable to face the deadly hail, and had to be withdrawn. The artillery preparations had entirely failed of their object, the defenders had

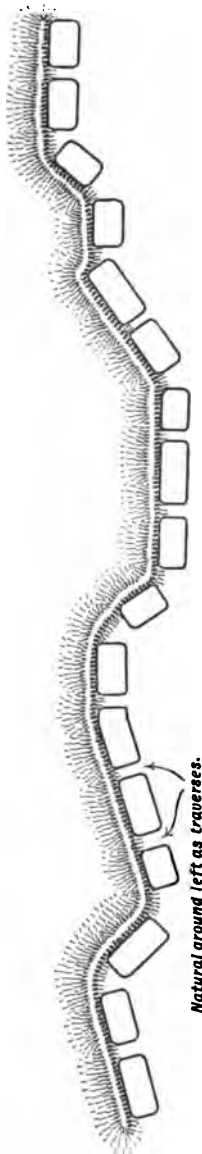
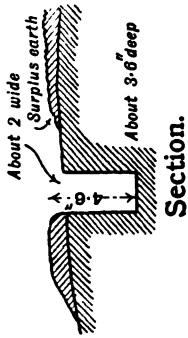
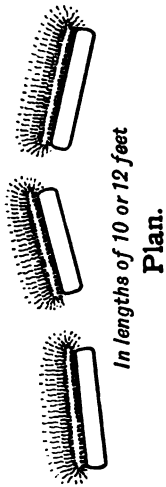
¹ Despatch dated 17th December 1899 by General Sir R. Buller to the Secretary of State for War.

suffered little loss, and had been in nowise shaken. The British infantry had, in fact, attempted the impossible—a frontal attack over open ground against unshaken and entrenched troops armed with magazine rifles.

The same painful lesson was experienced on many another bloody field. Again and again did it happen that for hours the British artillery would bombard the Boer positions with a heavy fire of shrapnel and lyddite shell till it seemed that nothing could live under it. But when, under the influence of this erroneous conclusion, the infantry began to advance, they were greeted with a deafening rattle of Mauser fire; the ground all round them was torn up by the shower of bullets; and heavy losses supervened, in spite of the extended formations, and the distance from the enemy's lines. All this time they could see nothing of their assailants whatever. For hours sometimes the attacking infantry would lie out in the open; each man glad to get the shelter of a miserable bush or a few stones to protect him; any movement replied to by a fresh hurricane of bullets, till at length darkness permitted of a retirement without further loss.

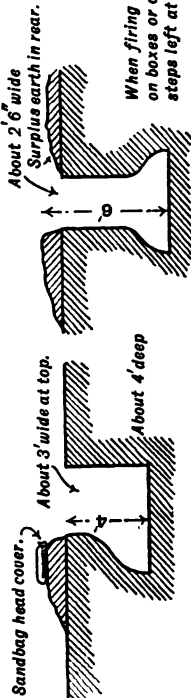
The old lessons of Plevna were indeed rubbed in with renewed force. The quick-fire which the Turks showed to be so deadly has become many times more so with magazine rifles. Even the widely extended lines adopted for attack in the present day do not prevent enormous losses, and the distance at which it begins to be highly dangerous to advance in the open has greatly increased. Musketry range now extends up to about 2500 yards, and movements within that distance have to be carried out in extended order. At ranges under 1000 yards troops, even in extended order, can hardly hope to advance over open ground at all against well-posted and unshaken defenders.

TYPES OF BOER TRENCHES.



Short trenches each for 2 or 3 men.

Plan.



Sections.

All Sections double the scale of Plans

This, however, is only what might have been expected with the increased power of the small-arms of the present day; but how is it that our powerful and well-handled artillery had so little effect on the defending troops, and failed entirely to shake their *moral*? The reason is probably to be found in the design and disposition of the Boer defensive works. These were nearly always in the form of deep and narrow trenches. They varied in depth from about $3\frac{1}{2}$ feet to 6 feet, and were often not more than 2 or 3 feet wide at the mouth. When the nature of the soil permitted, the sides were sometimes undercut or hollowed out, so as to give more room at the bottom. As often as not they had no parapets, the excavated earth being spread out over the ground so as not to be seen, or heaped up in natural hollows. Sometimes it was deliberately carried to a distance, and formed into a false parapet, with a view to deluding the attackers; in these cases the false parapet would generally be on or near the crest of the hill, and the real trench some way down the forward slopes.

The trenches were usually in short lengths, in traces adapted to the contour of the ground, and so located as to add to their invisibility, while at the same time admitting of an unimpeded field of fire over the ground in front. They were seldom if ever on the crest or sky line of hills, but as a rule some way down the forward slopes, and in these cases were provided with deep and narrow approaches from the rear.

It is easy to understand the immunity from loss which the defenders of such works experienced. Unless a shell fell right into a trench it could do no damage whatever, and a trench only 2 or 3 feet wide, even if it could be seen, would be a most difficult object to drop a shell into. As a matter of fact the Boer trenches were as

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a rule entirely invisible, and often the British guns concentrated their fire on the false parapets.

It will be readily seen what an enormous advantage defences of this nature have received from the introduction of smokeless powder, which makes it possible to keep a defensive position concealed for some time even after opening fire. The Boer guns also were usually well posted and well concealed, and, as they too fired smokeless powder, it was often a long time, even after they had opened fire, before they could be located and silenced. In the meantime, they were able seriously to annoy the attacking infantry, or the more exposed British guns. In some instances, moreover, they wisely refrained from replying to the British bombardment, and declined to be drawn into an artillery duel, with the result that their guns were unharmed, and available for effective use in the later stages of the combat.

Against a position of this nature, the defenders of which are not only unseen, but are often supposed to be in places where they are not, the most powerful artillery is practically impotent. As no appreciable losses are suffered the *moral* of the defenders is in no way shaken. A frontal attack by infantry in such a case has been recognised for the last half-century to be extremely dangerous; in these days of magazine rifles it is suicidal.

What then are the means by which an attacker will endeavour to capture a defensive position? The method employed by the British against the Boer positions, after painful experience had demonstrated the uselessness of frontal attacks, was to try and get on the defender's flanks. But in the case of a siege of a fortress, or the attack on an all-round position offering no flanks, such a proceeding would not be feasible.

Though none of the offensive operations of the

British forces in South Africa actually took the form of a siege, yet some of them were to a certain extent analogous operations. For instance, the various efforts to force the passage of the Tugela occupied a period of two and a half months, which is quite as long as many sieges. Though the Tugela position was not an all-round one, yet, on account of its great length and of peculiar natural features, it did not present accessible flanks. The British, when moving towards a flank, or endeavouring to concentrate on points thought to be less strongly held, were under the disadvantage of having to move a very great distance along the arc of a circle of very great radius; their forces too were necessarily slow moving, the bulk being unmounted. Long before they could reach their objective and attack it, the Boers, who had far shorter interior lines to move on, and whose mobility was very great, on account of their all being mounted, could bring large numbers to the threatened point, and could throw up trenches, &c., on it. The attackers thus gained nothing by their flank march, as they found themselves still opposed by a frontal defensive position. These conditions were manifested in nearly all the positions where the British forces attacked the Boers. In other words, a very considerable tactical superiority lay with the defenders, and it is to this rather than to the power of their weapons, the volume of their fire, or any other cause, that we may attribute the tenacious defence exhibited on so many occasions by the Boers.

The fact is that the new weapons have greatly increased the tactical strength of the defensive side. The necessity for having within the defensive line means of rapid access to all parts of the position, and of restricting or delaying the attacker's lateral movements outside

the position, have long been a recognised principle, repeatedly urged in the previous chapters of this book. The organisation of the lines of Torres Vedras afford a striking example of this principle, and the repulse of the Russian attacks on Plevna show in a marked degree the advantages gained to the defensive side when these conditions are secured. At the present day they are far easier to secure, and are of still greater advantage.

Tactical movements have always been impossible within the limits of the effective range of the defenders' weapons. In smooth-bore days such movements could be carried out at a distance of from 400 to 600 yards from the defenders' position, so a movement to a flank, for example, might take place along the circumference of a circle of that radius. Nowadays it must take place along the circumference of a circle of 4000 to 6000 yards' radius, if not more, and the distance to be traversed is increased in like proportion. Even in the case of a defensive position of comparatively small extent, such a movement on the part of the attacker might involve more than an entire day's march before his forces reached a point opposite their new objective. The defenders therefore have ample time to bring up superior forces to meet it, to strengthen the works, to retrench the line, or throw back a flank. Thus their natural tactical superiority is greatly enhanced by the increased range and power of the new weapons.

The sieges of the late war, in which the British enacted the part of defenders, do not afford such clear lessons as the operations in which they were attackers, although the latter were not regular sieges. The reason of this is probably to be found in the peculiarly unenterprising nature of the besieging operations carried on by the Boers, who as a rule confined

themselves to a passive investment, accompanied by an ill-directed bombardment.

None of the places in which the British forces underwent sieges were in any way prepared for defence. Till just before the enemy appeared in front of them they possessed no defensive works whatever. In addition to this, Kimberley and Mafeking had extremely weak garrisons and practically no armaments fit to oppose the Boer guns. Ladysmith, though it had a large and excellent garrison, had an inadequate armament, the only guns at all equal in weight and ranging power to the Boers' heavier pieces being the long 12-pounders and 4.7-inch quick-firing guns, which were brought up at the last moment by the Naval Brigade.

The works constructed by the British were of the simplest field type, constructed of earth and stones, sandbags and timber. Though differing in detailed design from those of the Boers, they aimed practically at the same end, namely, concealment from view and smallness of vulnerable target rather than actual material protection against projectiles. In many cases they were mere narrow trenches, and when they were larger than this they generally provided a good vertical face in rear of the parapet—usually revetted with sandbags or stones—behind which the defenders could be in security from the Boer fire. Overhead cover was sometimes provided, when timber or other materials to make it were available, and shelter against artillery fire for supports, reserves, and for civilians was more generally obtained by making hollows or caves in the reverse slopes of hills, in the banks of rivers and dongas, in the spoil heaps of the diamond mines (as at Kimberley), &c.

At Mafeking great ingenuity and perseverance were displayed in the construction of the works. Notwith-

standing the extreme paucity in numbers of the defenders—some 700 against about 4000 Boers—the line of defence originally taken up was of considerable extent (five or six miles in perimeter), and was afterwards still further extended. The works generally took the form of small redans, their trace in every case being adapted to their situation. At first they were dug out and kept low; but afterwards, when the enemy's shell fire was found to be inaccurate, and difficulties of drainage appeared, they were made of greater command. Head cover on the parapets was found to be essential, and when the works were close to the enemy's trenches, sandbags or timber were found to offer too good a target for this purpose, so steel loopholed shields were used. Bombproofs were in many cases provided and also covered communications. As the siege progressed counter-trenches were pushed forward and advanced works established, gaining point after point till at length at one part the counter-works were within seventy yards of the besiegers' works. By this means grazing ground for the defenders' live stock was obtained, and the enemy were pushed back at all points beyond musketry range of the town. These very active and energetic measures remind one of those undertaken by Todleben at Sebastopol; and, though they were on a smaller scale, they were carried out with infinitely smaller resources.

The defence of Mafeking forms a striking example of what can be done by able organisation and good leadership. Though devoid of nearly everything which is usually considered essential for a prolonged defence, Mafeking in every way fulfilled the objects required of a defensive position; that is to say, its very small garrison not only successfully resisted for over seven months, but also, in fact, held fast before itself and prevented from

joining in the other operations of the war, a force of the enemy many times superior to itself both in men and guns. For the first month of the siege no less than 8000 Boers with ten guns were contained before it, and after Cronje's commando had gone south Snyman had between 3000 and 4000 men and six guns—one of which was a 94-pounder siege gun—before the place for the remaining six months. A loss of over 1000 killed and wounded is said to have been inflicted on the besiegers. Altogether a fine achievement for a garrison of 700, none of whom were regular troops, aided by 300 civilians as town guard. The operations and organisation are fully described in Major-General Baden-Powell's official report, which is of extreme interest and well worthy of study. It is reproduced as an Appendix at the end of this volume.

The damage done by the Boer artillery in all these sieges was absurdly small. They knocked about the houses in the towns to a certain extent; their reasons for directing so much of their fire on these presumably being that they offered an inviting target; but the losses inflicted by them on the troops in the defence works were inappreciable. This was probably to a considerable extent due to the want of intelligent directing of the Boer artillery fire, and to the inferiority of their shrapnel and fuses, which made their fire very ineffective. The very inferior British ordnance, even the farcical armaments of Kimberley and Mafeking—old muzzle-loading 7-pounders, ancient pieces dug up for the occasion, and even guns forged during the siege in local workshops, with locally made shells and fuses—all managed to hold their own with the heavy Boer artillery, instead of being rapidly overwhelmed as they ought to have been. It is evident therefore that no very reliable deduction as to the effect of heavy artillery against troops behind earthworks can

be drawn from the want of success of that of the Boers, which was so ill handled. But on this head ample evidence can be obtained from the results of the British artillery, which was not ill directed or ill handled, upon the Boer defences, particularly at Colenso (already mentioned), at Paardeburg—where fifty pieces, including 5-inch and 6-inch howitzers firing lyddite shells, and 4.7 inch guns, bombarded Cronje's position, containing 4000 Boers, for three days, and only produced, it is said, some fifty casualties—and also at several other places during the war. It appears from these examples that troops in well-designed and concealed earthworks have little to fear from the fire of even heavy artillery.

The Boer operations at the three sieges were not conducted with any vigour. Though they constructed defence works to protect their infantry and guns, they did not attempt any systematic approach operations with a view to getting close to the defenders' works. Nor did they do much in the way of assault. The infantry attacks made by the Boers in the earlier parts of the siege at Mafeking were not on a very large or vigorous scale, and were beaten off with ease. At Kimberley they made no assaults, being apparently deterred by the knowledge of the existence of land mines, and by the defenders employing search-lights at night. At Ladysmith only two attacks were delivered. That of the 9th November was not pressed to close quarters; but the assaults of the 6th January were of a determined nature, and led to severe fighting. On this occasion the attacks were delivered on nearly every part of the defensive circle; the assailants, having secured the advantage of successful surprise, penetrated in several places, and obtained possession of parts of the British positions. If after this they had been properly supported it is difficult to see how they

could have failed to hold these points, and this would have led eventually to the fall of the place. But on this occasion, as always, tactical movements on the attackers' exterior lines were naturally difficult and slow; also, perhaps, the Boers' tactical organisation and arrangements for handling troops in action were not of the high order that is necessary for concerted action; at all events, the successful attacks were not supported, while the British, with their easier and shorter interior lines, were able to bring up more and more reinforcements to the points of danger. Thus all the attacks were eventually driven off.

At the last Boer attack on Mafeking, on the 12th May 1900, the same conditions were observable. The assault was delivered at dawn by some 300 men and was partially successful, part of the defensive lines being captured, and some prisoners taken. But in the darkness the attackers had got split up into three parties, and as the light increased prompt advantage was taken of this by the defenders to still further separate them. The parties that had penetrated were then surrounded, to prevent reinforcements reaching them, and were attacked in detail. As they were not supported they had to surrender, 108 prisoners, among whom was Commandant Eloff, being taken. The attackers further lost 60 killed and wounded. This exploit by the enfeebled and half-starved garrison at the very end of the seven months' siege reflects the highest credit on the brain which directed it and the men who carried it out.

Of counter-attacks on a large scale by the defenders, the three South African sieges afford no example. At Mafeking and Kimberley the garrisons were far too weak in numbers for any such operation to be thought of; but at Ladysmith, which had a garrison of 10,000 troops of excellent quality, this reason does not hold good. Of

small sorties, however, a considerable number took place. At Mafeking, for instance, there were seven. They were made by small forces, as suddenly as possible and rapidly withdrawn, so as not to give the enemy's supports time to come up and overpower them. Their object was to annoy, harass, and cause loss to the besiegers, and in these objects they were successful. Some of them were carried out with very little loss; but as the besiegers added to and strengthened their defensive works, operations of this nature became more dangerous, and after the unsuccessful attack on Game Tree Fort on the 26th December 1899, where considerable loss was incurred, they were given up. The same thing occurred at Kimberley; after it was found that the strength of the besiegers' works precluded these sorties being carried out without undue loss, they were given up. At Ladysmith only two sorties were made. These were both by small forces at night, and were undertaken in each case for a specific object, namely, the destruction of certain of the besiegers' guns. Both were successfully carried out.

As a matter of fact, counter-attacks by the defenders have been rendered much more difficult and dangerous by the increase in the power of weapons, particularly of rifles. As long as the defenders remain in their entrenchments, and the attackers to get at them have to advance over the open, all the advantages rest with the former. But as soon as the defenders quit their cover and advance in the open against the besiegers' positions, they throw away their advantages, which transfer themselves to the other party. The rôles, in fact, are changed. It was probably a consideration of this fact which was the cause of no counter-attacks in force being attempted during the defence of Ladysmith, where, though the

garrison was considerable, the besiegers' positions were very strong.

Several novel features in the way of ordnance have been exhibited in this war. It was practically the first appearance in the field of field and siege howitzers. The advantage of having accurate high-angle weapons, firing heavy projectiles, has already been mentioned; to search out cover, &c., they are particularly valuable. It is believed that whenever they had a visible target they entirely fulfilled the expectations formed of them.

The use by the Boers of mobile pieces of a weight and calibre far exceeding anything that had previously been made use of in field operations came at the beginning of the war as a revelation. The British were not long in following their example, and whole batteries of these weapons, which weighed with their carriages sometimes four tons or more, were employed in the subsequent stages of the campaign by both sides. These guns were moved about in the field, over difficult ground, up the sides of hills, in a surprising manner; and the way in which the Boers have managed to save theirs from capture, and remove them when retiring before superior forces, is extremely creditable. It is evident that the employment of mobile weapons of this calibre (up to 5-inch and even 6-inch) confers a considerable additional power on the defensive side, whose shorter and better means of communication between different parts of their position would enable them to use them with great effect.

Another weapon which made its first appearance upon the battlefield is the small calibre automatic gun, better known as the pom-pom. The effect of this weapon is rather moral than actual. The terrifying effect of the swarms of little shells bursting all around led undoubtedly to some exaggerated ideas being formed

about it. The pom-pom might perhaps fulfil a useful purpose on the defensive side, more so than on the attack. Against works it is useless, and its only effect is against a good target in the open. Such a target is more likely to be occasionally offered by the attackers, and as the gun can be easily concealed, it might render effective service to the defence on favourable opportunities.

On the whole the principal new lessons to be learnt as regards defensive action from the South African operations are that mobility and freedom of tactical movement on the part of the defenders, both men and guns, are above all things the most important adjunct of the defence, and with the long ranging weapons of the present day these conditions are easier than ever to obtain. Also, that security against the attackers' artillery can at present best be secured by concealing, as far as possible, the defenders' works and gun positions, and designing them so that they offer as shallow a target as possible. Infantry in such works are extremely hard to shake the *moral* of, or inflict loss on. Frontal attacks are less possible than ever, on account of the overwhelming fire produced by the magazine rifle. Inferiority in ordnance on the part of the defenders can best be neutralised by refraining from exposing the positions of their guns in the earlier stages of the fight, or, if necessary, by withdrawing them under cover during the bombardments by the besiegers; also, by securing for them the highest possible mobility and freedom of tactical movement. By this means the defenders' guns will be available for use in the critical periods of the siege, and can be massed on the important points when required.

For the infantry positions the principal consideration

is that they should permit of effective use of the rifle upon the ground over which the attackers must advance. The necessity for concealment and smallness of target has already been mentioned. Some form of cover for the defenders' heads and shoulders when firing is very necessary in these days of accurate shooting. Bomb-proof cover in the close vicinity of the firing line is very desirable, or if it cannot be made bombproof then splinterproof shelters well concealed should be provided. Similar shelter for the supports in rear, and ready means of access from these to the firing line are necessary.

To secure the best tactical effect good communications and well-matured organisation are evidently of the utmost importance, and in this respect all the suggestions under this head, quoted in the last chapter from Sir G. Clarke's "Fortification: its Past Achievements and Future Progress," still hold good.

From a survey of these lessons it will be seen that the predictions made by Sir G. Clarke in the above-named book have been completely fulfilled. It is possible that in some details the actual designs of works as proposed by him would not be suitable for to-day, but that is only to be expected from the rapid march of events since 1890, when it was written. The broad principles put forward therein, namely, in regard to the immunity of low, well-concealed earthworks, and hidden mobile guns, to the value of communications and organisation and the importance of tactical mobility, and lastly with respect to the great increase in power conferred on the defence generally by improved weapons, all have been completely justified.

It is equally evident that most of the forms of works and special details recommended by the Continental

school are to us of no value whatever, whatever they may be under the different strategical conditions which prevail in the land of their adoption. Deep ditches and caponiers, escarps, reduits, continuous enceintes, &c., all seriously defended up till quite lately, are totally unnecessary forms of extravagance. Simple trenches have shown themselves to be at least as useful as the immense concrete forts which have been suggested abroad, if, indeed, not far more so. The supreme necessity for tactical freedom and mobility for the guns of the defence armament makes it difficult to conceive that putting the latter into immovable cupolas could be a judicious arrangement. Complete material protection from shells is, of course, an advantage, but it seems hardly possible that it can be worth having at the entire sacrifice of mobility. The argument so frequently put forward, that guns in open emplacements will be immediately overwhelmed, has not been borne out by experience, when the artillery positions were judiciously chosen, and the guns were mobile and well handled. This question will, however, be discussed at greater length in a future chapter.

The above is only a brief outline of the lessons in regard to the defensive art which are furnished by the events of the war in South Africa. Many others will be noticed in the following chapters, which will contain a consideration of the measures which, under the conditions of the present day, appear to be the most suitable for the preparation and organisation of a defensive position.

Since the siege operations of the Boers against the British beleaguered towns do not, as has already been shown, give a reliable conception of what would be done by a more active and enterprising besieger under the

same circumstances, it is as well to examine what form the siege of a fortified place in the present day is likely to take. It is evident that neither the passive investment and bombardment of the Boers nor the direct frontal assaults of the British would be the mode undertaken by a scientific besieger. As an all-round position would presumably offer no flanks, that method of attack would also not be possible.

Under these circumstances it is almost certain that the besieger would adopt the same tactics as the defender. He would go to ground too. The formal siege operations of the past days, the approach by arduous trenchwork, &c., would be revived, though of course greatly modified to suit the conditions of the present day. Concealment would be the first thing sought for, both for the siege batteries and the infantry trenches. The execution of the latter would present many difficulties, but it would have to be undertaken, either by night or by means of sapping. Wherever the ground favoured it, or tactical circumstances afforded the opportunity, a short advance might be made and the ground thus gained held by rapidly throwing up light cover. The late war showed many examples of how the lightest cover—even a few stones—would enable determined troops with magazine rifles to cling to the ground they have won. As a rule, however, advances would only be made by night, and would be very short. The trenches thus made would in every case be connected up with those in rear by oblique approaches. In the nearer stages of the attack it might be impossible to execute trench work, or sap, even by night, or to live in trenches at all under the hail of the defender's quick-firing armament and machine guns. In that case blinded saps might be resorted to, or mine

galleries driven just below the surface of the ground. At all events, though it is impossible to forecast in detail the form of the attack, we may at least assume that as a rule the combat on both sides would be largely one of pick and shovel, trenches and counter-trenches, mines and counter-mines.

It has been considered advisable to refer to this, as for the consideration of the measures requisite for the defence of position in the present day, which is going to be discussed in the following chapters, it is as well to keep in view the probable forms the attack will take.

CHAPTER XII

METHOD OF FORTIFYING A POSITION IN THE PRESENT DAY—GENERAL POSITION OF THE MAIN LINE OF DEFENSIVE WORKS—SECOND LINE—TACTICAL SITUATION OF WORKS—FORM OF FORTIFIED POSTS—GREATER DISPERSION—POSITIONS FOR GUNS—COMMUNICATIONS—CONCEALMENT OF INTERIOR OF DEFENDED AREA—COMMAND—GENERAL PRINCIPLES GOVERNING SELECTION OF SITES

THE development of the art of Land Defence, more commonly called Fortification, has now been traced down to the present day. An endeavour has also been made, by means of a description of the principal sieges of the last century, to trace the principles which govern the art, and to show how these principles have been applied under the varying conditions brought about by the constant changes which have taken place in warlike weapons. Finally, the conditions which have been shown by the war in South Africa to govern the problem at the present day have been described. It now remains to enter on a detailed consideration of the actual measures by which these principles may be applied to the defence of any given position—that is to say, of the manner in which a position should be prepared and organised for defence in the present day. In doing this no attempt will be made to lay down rigid rules or to establish typical forms of works that will be suitable to all circumstances. It should be remembered that the true essentials of a fortified position cannot be expressed on plans and maps at all. The disposition and the

design of the defence works should be decided on in no place but on the actual ground to be defended itself, and only after a full consideration of the tactical circumstances. Defences evolved at the office table or modelled on the theories laid down in books will seldom be found to fulfil the requirements of war. As the tactical conditions, that is, the conformation of the ground, the nature and direction of the expected attack, the strength of both combatants and the weapons employed, will vary greatly in different cases, it would be impossible, even if it were advisable, to lay down any system which would be applicable to all. Even the designs of the individual works depend solely on the tactical conditions. Type designs are therefore useless.

It is due almost entirely to a neglect of the above principle that permanent fortification in the past became so divorced from military requirements. The method of designing fortifications according to types and systems instead of according to tactical principles was productive of immense harm. Technicalities and useless geometrical elaborations were permitted to smother the real principles. This accounts for the fact that elaborate and costly works which have been designed in times of peace by theorists have often failed to acquit themselves well when put to the test of war, while simple defences, designed on the ground by practical soldiers, have fulfilled all military requirements. But it is often an absolute necessity to design and construct fortifications in times of peace. We must, therefore, be careful to make sure that the principles upon which we do so are the same as those which were acted upon in the successful defences of the past, and that they are applied in conformity with the tactical conditions of the day and place.

The methods and principles suggested in the following pages may be taken as equally applicable to Field as to Permanent Fortification. It is difficult to draw a line between these two and to say where one ends and the other begins. There is, in fact, only one Art of Fortification, and consideration of the men, time, and materials available for execution of the work, is but one of the many factors that govern the consideration of the question in every case.

Defensive positions may be of different degrees. We have at one end of the scale the great extensive fortified position guarding some important city or strategic point, liable to be assailed by a formidable force, and therefore requiring an army for its defence. At the other end we have the small fortified post holding a road, a pass, or a bridge-head, and occupied by a small detachment. Again, the methods of defence vary according to the weapons in the hands of the expected attackers, and many of the measures that would be necessary against a civilised foe, armed with the latest patterns of ordnance, would be unnecessary and even unsuitable against savages with inferior weapons, or forces without artillery. We will begin by considering the defence of a great fortress or fortified position against a civilised enemy.

A great fortress or all-round defensive position would consist at the present day of a series of fortified and strongly held positions surrounding the town or other object to be defended, and so situated in tactical relation to each other that it would be impossible for an attacker to penetrate to the interior of the defensive line without first capturing some of these positions.

In fixing the general situation of the main line of defence there are many considerations to be looked to. First, it has to be decided at what distance out from the

town (or defended object) it should be. It is as a rule desirable that it should be at such a distance as will keep the enemy beyond bombarding range of the place. It may not, however, be always possible to provide for this, for it might entail the taking up of a perimeter too extended for the available garrison. For instance, at Ladysmith the Boer artillery positions commanded the town and practically the whole of the interior of the defended area, and were thus able to bring to bear on them a very galling fire. The only way in which this could have been prevented was for the British themselves to have occupied the hills on which the Boers placed their guns. But this, it is stated, would have made the line of defence much longer than could have been effectively held by the garrison available.

Sometimes it will not be a matter of vital importance to keep the enemy beyond artillery range of the place defended. The bombardment of a mere town, if it has not any troops in it, would not generally fulfil any military end, and should not in any way influence the result of the siege. A colonial town, where the houses are scattered widely apart, cannot be very seriously damaged by bombardment except by a very disproportionate expenditure of ammunition. In the South African towns the damage done was very small; at Mafeking it was assessed at about £16,500 only, and in the other towns was probably less. The inhabitants mostly took refuge in dug-out shelters, and did not suffer very much loss. Under such circumstances the keeping of the enemy beyond artillery range, although desirable, should not be insisted on if it entails the sacrifice of important military requirements.

In European towns where the buildings are much crowded together, immense damage to life and property

would be caused by bombardment with the weapons of to-day, and it is conceivable that in certain cases recourse might be had by a besieger to this in order that the sufferings of the civilian inhabitants might lead the commandant to surrender, or that riots, anarchy, or popular clamour might bring about the same result. Such tactics have been resorted to often before. Again, the object defended might be (in addition to a town) a dockyard, important arsenal, or great depot of supplies or munitions of war, the destruction of any of which by the enemy's shell-fire might have a calamitous effect.

In such cases it would be a matter of very great—perhaps of supreme—importance to keep the enemy beyond artillery range, and this must in such cases be secured, even at the sacrifice of other interests. It will be convenient in the following pages to always refer to the object defended as the town. It will usually be a town though not necessarily so always. Cases, of course, will sometimes occur when other considerations apart from the danger to the town of bombardment will govern the situation of the main defensive line. For instance, at Kimberley it was necessary to extend the latter much more than would otherwise have been required in order to protect all the mines. Again, the conformation of the ground may be such that there is only one possible line of defence, and this must be occupied, notwithstanding that it does not fulfil the condition of protecting the town. The following remarks, however, apply to cases such as are most generally met with in reasonably open country, where there is a certain amount of freedom of choice in fixing the lines of defence.

The distance from the town at which the main defensive line must be in order to secure the end

above mentioned, would depend almost entirely upon the conformation of the ground. It does not follow that in order to keep the enemy beyond artillery range the main defensive line itself must be beyond artillery range of the town. There will generally be at a certain distance outside the town, but perhaps within siege artillery range of it, a ridge or line of hills, elevated ground, or some other feature, which is by nature more suitable tactically for a defensive position than the ground for some distance before or behind it. The occupation of such a line would, of course, prevent the enemy from establishing his batteries within a certain distance of itself. If the nearest position in which the enemy's batteries could in such a case be established were beyond extreme artillery range from the town, the object under discussion would have been gained. The distance at which the attackers' batteries should be kept off may be taken in the present day at about 10,000 yards, but this, of course, would be modified in localities where it would be clearly impossible for him to bring up the heavier nature of guns.

On the other hand, it may happen that there are commanding positions at long artillery range from the town which it is impossible to prevent the besiegers from occupying, except by occupation of them by the defenders; in such a case those positions must be occupied, unless the doing so would make the defensive line too extensive for the garrison available.

Sometimes it will be sufficient to keep the enemy's positions out of sight of the town, as unaimed and unobserved fire will seldom be effective, and it may happen that a conveniently intervening range of hills would effect this; it should, however, be remembered that observation of fire can be conducted with sufficient

accuracy to hit a town or other large area from captive balloons, so the end would not be achieved if the town could be seen from balloons sent up from the besiegers' positions, if the latter were within range.

The conditions may, and probably will, vary in different parts of a defensive circle, and the main line of defence would in such a case be pushed out in parts and drawn back in parts, according to which of the above conditions prevailed, care being of course taken that all parts of the line were mutually supporting.

There is another reason which makes it desirable to keep the main defensive line at a considerable distance from the town. It will seldom be wise in the case of a large and important fortress to rely on a single line of fortified positions for its defence. Some kind of second line or retired position, in case some of the works in the front line are captured, would in most cases be necessary. A discussion of the nature and situation of the works of the second line will be entered into later; it is mentioned here in order that it may be remembered, when a second line is contemplated, to leave room for it when deciding on the situation of the main line.

It is therefore necessary to choose a position for the main line which will be not only suitable for defence in itself, but which has in rear of it facilities for providing a second line, and the second line must not be commanded by the first, or else it would fail of its object, for in such a case if a portion of the main line were captured, the attackers would be able to render the works of the second line untenable. There might, of course, be cases where over part, or parts, of the defensive circle there would be no necessity for a second line, either by reason of the main position being very

strong in itself, or easily capable of reinforcement if attacked, or on account of natural and tactical features making an attack on those parts very improbable.

It will be seen, therefore, that by reason of the conditions mentioned above, the main defensive position will usually be at a considerable distance from the town. It is useless to fix any usual or average distance, as it would depend in each case on the conformation of the ground and the garrison available, but in first-class fortresses it will probably be not under three miles, and up to as much as seven, or even more.

When examining sites for the choice of a defensive position it not infrequently happens that an observer, standing on a proposed position, finds at some distance in front a ridge or other well-defined feature which, even if not actually at a higher level than the one on which he is standing, appears to command it, and certainly conceals from view all the ground beyond. In such a case it may be thought that a better defensive position would be obtained by going out to the advanced ridge; it is seldom, however, that finality would be obtained by doing so, as it is extremely probable that from the advanced position another inviting hill or ridge would be seen further to the front again. If these temptations to go further out were yielded to, the defensive position taken up would probably be far too great for the force available.

The selection therefore of the best general line of defence is a matter of compromises and of balancing advantages and disadvantages. It must not be too close in, as the enemy must be kept a certain distance off; it must not be too far out, or it will be too extended for the garrison. It must have certain tactical qualities which render it easy of defence, and within these limit-

ing conditions it must be the best that can be found. How to estimate the garrison which a given defensive position will require, in order that it may be ascertained whether the one selected is too large for the force available, is an important question which will be fully discussed later on. Meanwhile, it is desirable to mention the tactical features or qualities which are required in a good defensive line, and which have to be borne in mind in its selection, and then to describe generally the form which a defensive line will probably take in the present day and the manner in which it would be occupied and fought. It has frequently been stated in the earlier chapters of the present volume that there are three prime conditions to which every defensive position should conform, namely, that it should admit of full scope for the effective use of the defender's weapons; that it should restrict as far as possible the effect of the attacker's weapons; and that it should provide full facilities for tactical control and movement of the defender's forces. The descriptions given of the important sieges of the past have, it is believed, shown that these principles are universal in their application. The South African war has not only demonstrated that they still as fully hold good as ever, but has also indicated how under the conditions of the present day they may be attained. In selecting a defensive position, therefore, these principles must be borne in mind.

A great fortress or all-round defensive position has been defined, in the earlier part of the present chapter, as a series of fortified and strongly held positions surrounding the town or place to be defended, and so situated in relation to each other that it would be impossible for an attacker to penetrate to the interior of the defensive line without first capturing some of these positions.

If a hill or other commanding feature be occupied by some of the defender's troops in such a manner that they can sweep with the fire of their weapons—namely, rifles, or guns, or both—the ground in front and on both flanks of it, then none of the attacker's troops can pass by that position within the limits of effective range of the weapons of the troops holding it. If the defenders hold two such positions situated at such a distance apart that the occupants can sweep with their fire the whole of the ground between them, then the enemy would be unable to pass between the two, or within effective range of their outer flanks.

A series of positions all round the town arranged in the above manner, so that the ground between every pair can be swept by rifle fire from the works, would make it impossible for the enemy to penetrate without capturing one or more of the fortified positions. This could only be done by frontal attack, and against frontal attack it ought, in the present day, to be possible to render a fortified position secure.

The above are the general principles on which the disposition of the fortified posts in the main defensive line round the town would be made. The principles apply equally to cases where the position is not an all-round one, but is a straight line or an arc with secured flanks. It is imperative, however, in such cases that the flanks cannot be turned. The intervals between the posts would not necessarily be all the same. Where the ground in the intervals was absolutely open and flat it might extend up to 3000 or 3500 yards; where it was less favourable it might be necessary to make it only 2000 yards or even less. If it was very broken, so that there was much space concealed from view from either of the adjoining works, subsidiary works or trenches,

generally of field profile, might sometimes be necessary in the intervals to see into the dead ground. The question of the treatment of the intervals will be dealt with more fully later on.

Generally, however, the distance apart of the posts would be governed mainly by the presence of localities affording facilities for defence, or commandingly situated as regards the adjoining ground. On all irregular or undulating country there will generally be certain elevated spots which are evidently the most suitable for carrying out the functions mentioned above, and which would therefore be so occupied, provided the intervals they gave were not too great. In some parts of the line it might be found that by reason of the curvature of the ground no single position could be found from which the ground on either flank could be overlooked for a sufficient distance. In such cases it would be necessary to split up the position into two, one to deal with the ground on the right, and the other, perhaps several hundred yards away, in a position to see the ground on the left, both being able also to defend their own fronts and the interval between each other. It will be seen therefore that the intervals will depend very largely on physical conditions. It is, of course, understood that every one of the fortified positions must have a clear field of fire to its own front.

All main roads or other lines of approach by which an attacker's columns would probably advance should be covered by the fire of positions, such as the above. Generally speaking, on parts of the defensive line where the country is open and flat, the works may be simple in nature and the intervals considerable; where it is hilly or broken special consideration must be shown, and the intervals may have to be short or

to be considerably strengthened with subsidiary field works.

It is now necessary to consider what will be the form of the fortified posts above mentioned. This will be treated in full detail in another chapter, so a general consideration only is necessary here. In works dealing with this subject in the latter part of the nineteenth century they have generally been described as detached forts, or else as infantry redoubts with independent artillery positions outside. It is doubtful, however, whether either of these forms as generally understood is suitable in the present day.

Anything in the nature of a fort or redoubt must always form a more or less conspicuous target, and anything in the nature of a target may be certain of receiving a concentrated and heavy fire from the besieger's batteries. The interior of a redoubt will necessarily be somewhat crowded, and heavy high explosive shells dropped into crowded restricted spaces are known to have a most destructive effect.

It is quite permissible, on account of the greatly increased defensive power of the rifles of the present day, to space the defenders of a line of parapet at much greater distances apart than was the rule in past times. A line of men with magazine rifles, four to six paces apart, behind good cover, can bring such a hail of bullets over the open ground in their front up to a considerable distance from their own position, as to inflict terrible loss on any troops endeavouring to advance on it. Such dispersion, moreover, is advantageous in that it reduces the risk of casualties from the hostile fires, and in an immovable defensive position cannot be considered too great for effective supervision and control. The question of the necessity for supports to such a firing line, and of their

location, &c., will be dealt with when this subject is under detailed discussion. It is only intended here to show that the increasing power of weapons has rendered dispersion, on the defensive side as well as on the attacking side, not only permissible but also desirable.

Defensive positions therefore may, and should, be considerably more extended than of yore. A regular redoubt under such circumstances becomes almost impossible to adapt to most of the types of ground ordinarily met with.

It seems probable therefore that each of the detached fortified posts that go to make up a great defensive position would consist merely of a locality or tract of ground rendered defensible by a skilful treatment of its natural features, that is to say, by the provision of simple trenches or parapets, in such a manner as to interfere as little as possible with the natural appearance of the ground.

The conditions that would be sought for in laying or constructing these trenches or parapets would be, as in all other defensive works, a good field of fire over all the ground over which the enemy could advance, as great a measure of invisibility as it is possible to obtain under the local conditions, and good cover from musketry and ordinary artillery fire; lastly, good covered and concealed means of communication with all parts of the position.

It is not intended that these works should be mere field works. Whenever it is possible to prepare defences deliberately beforehand much greater effect can always be obtained by the greater resources which under those circumstances are available. For instance, with the aid of proper building materials far better cover can be secured, and judicious grassing and planting followed by the ordinary operations of time will assist greatly in pro-

moting invisibility. Covered communications also can be made beforehand in the form of vaulted passages.

It would be perfectly justifiable to apply to an extended fortified position of this description the name of a redoubt or fort, for such in essence it undoubtedly would be; but in order to avoid misconception it has been judged best to refer to it as a fortified position or pivot, and this practice will be adhered to.

The guns of the defence would be placed in such situation as would afford the greatest scope for their fire, combined with as great a measure of invisibility as the circumstances will admit of, and also with the power of unobserved removal and bringing up. They need not necessarily be right clear of the infantry portions of the fortified positions, for the conditions are very different to those which prevailed in the case of confined forts of the old type. In extended positions of the type above described, it would not be difficult to find for the guns sites so placed that they would not draw on to the infantry trenches the hostile artillery fire. It might often be that the best sites would be on the flanks of the infantry, but it is not necessarily so, and they might sometimes be placed so as to fire over them.

We now see that when endeavouring to select the general defensive line for a fortress we must seek localities which are capable of being treated in the manner described above. There are also other conditions which must receive attention. Good means of communication between all parts of the general line of defence, and also from the town or headquarters to all points on the line, are of vital importance. When the defences can be prepared deliberately in peace time, good roads, and also perhaps lines of rail, can be constructed, and these should be amongst the first objects to be dealt

with. Where the country is difficult, it is hardly too much to say that these are of greater importance than the works themselves. When, moreover, the position is one where hostile attack is almost immediately expected, the selection of the line to be occupied may have to be governed to a certain extent by the question of communications. It may in such cases be inadvisable to occupy a position which is difficult of access (from the defender's side), or to which guns cannot be taken on ordinary travelling carriages. At all events the feasibility or otherwise of rapidly improving roads, both radial and lateral, is a point that should enter into the calculation. Conversely, it is very desirable that the lateral communications behind the attacker's positions should be as bad as possible. Rough country, deep ravines, rivers, hills, &c., more or less at right angles to his front, will greatly retard his movements. It may occasionally happen that by placing the defensive line further forward or back, the attacker's zone of country can be moved into such localities, and thus be a gain to the defence. Similarly it is easy to understand that the position of the defensive line may sometimes be influenced by the possibility of depriving the enemy of good sources of water supply or of food supply, such as grazing ground, crops, &c., or by the necessity of bringing such localities within the defended area.

It is of great advantage if the main defensive line can have the ground steeply sloping away from it in its immediate rear. Not only would such a conformation make it easy to provide cover for local reserves and for the defender's encampments, but it would conceal from the enemy's view all that went on within the defender's lines. The latter condition is of infinite value, and worth many sacrifices to obtain. At all events the

general position taken up should, if possible, be one which admits of situations being found out of view of the enemy for the camping grounds of the defending troops, and also of the communications being concealed. If the latter cannot be achieved by natural means, it should be by artificial, that is, by making the roads in cuttings, and making the spoil into a bank on the side next the enemy.

The mere fact that the position which would be occupied by an attacker is at a somewhat higher level than that of the defenders is not necessarily a serious defect. We are taught from the earliest period of our military education to regard with horror the idea of being commanded from a point within range. This, however, is mainly a legacy of smooth-bore days. It can easily be conceived that to have the enemy occupying a hill 50 or 100 feet higher than one's own position, and distant from it only 500 to 700 yards (beyond which distance it would in those days have been out of range), would be a most objectionable state of affairs. But to have the hostile positions 50 or 100 feet higher than your own, when they are 3000 or 4000 yards distant, is not necessarily a great detriment. At such distances neither artillery nor rifle fire derives any appreciable advantage from firing from a slightly higher position. It is not as if the defenders were in a defined redoubt or fort, with a *terre-plein* on which they must move about. On an extended fortified position of the nature which has been described, where the works are narrow trench-like excavations, and the defenders will keep under cover, they will not be materially more exposed than if they were on the same level as the enemy.

The really important condition is the manner in which the ground within and in rear of the defensive

position lies. If it is flat and open, or sloping somewhat towards the enemy so that it can be well seen over from the enemy's positions, and that reinforcements of the works in the front line or movements within the circle cannot take place without incurring artillery fire, then for the enemy's position to be even slightly commanding will be most objectionable. If, however, the ground in rear slopes away so that all movements inside the defensive line are hidden from the enemy, then a slight command at long ranges can be tolerated. It is, in fact, often impossible to avoid this condition, which of course necessitates more careful arrangement of the works, particularly of the gun emplacements.

A very great command within artillery range is of course very objectionable, and any command at all at short musketry range is intolerable, not only on account of the increased effect accorded by it to the enemy's fire, but also of the fact that the attacker will be able to approach unseen and unharmed to within so short a distance of the defender's position, and will have traversed rapidly and without loss a great tract of ground which ought to have cost him long delay, arduous toil, and heavy loss. If a position of this nature exists in front of the defender's line, it must be occupied by the defence as an advanced post.

It is impossible to lay down any rule or draw any line as to within what limits of distance or height a hostile commanding position may be considered fatally injurious. It is only possible to state the general principles, the application of which will be a matter for judgment in every case according to the circumstances.

It is generally considered very advantageous to place the defensive works if possible on commanding heights. It is doubtful, however, whether beyond a certain point

this is an advantage. Musketry fire with low trajectory rifles of the present day is positively less effective from a height than from a low site. It is best when it can be made to as near as possible graze the surface of the ground over which the attackers must advance. The same argument applies to the fire of low trajectory high velocity guns; with these against troops in the open it is desirable to burst the shrapnel with as flat or grazing a trajectory as possible. For fire either of guns or howitzers against works, an elevated position gives better searching effect, but at long ranges this does not make so much difference as is generally supposed. A high site for a defensive position has also certain positive disadvantages. Hardly any hillsides are at a uniform glacia-like slope all the way up. If they are convex in section, that is, having the steepest part at the bottom, it is impossible to avoid having a good deal of the hillside and ground at the foot hidden from the defender's positions, and therefore the attackers can advance up it unseen and unharmed. If it is concave, that is, having the steepest part nearer the top, then to be able to see and fire all down the slope the defenders are obliged to expose themselves greatly to distant fire. Moreover, on to an elevated position the attackers' artillery can safely keep up a heavy fire over the heads of their advancing infantry till the very last moment.

Elevated positions derive a certain amount of advantage from the fact that it is less easy to search out the works by the fire of the attackers' artillery. But well-concealed, narrow, trench-like works have in any case little to fear from this form of fire. A more positive advantage is found in the fact that elevated positions, such as those on ridges, lines of hills, &c., will nearly always give concealment from the enemy's view to the

interior of the defended area. This, as has already been mentioned, is a most valuable quality. Similarly such positions permit of a range of view over the attacker's positions and enable the defenders to note his movements. Observation of artillery fire is also more accurately carried out from elevated points.

For these last reasons, therefore, it is desirable for a defensive position to have a certain amount of command over the ground over which the enemy must advance. The actual height, however, need only be sufficient to give a good view over the ground in front, particularly to clear all obstacles to vision, such as crops, trees, undergrowth, &c., and also to obtain concealment for the interior of the defender's lines. With flat, open country it may be very little indeed. The slopes to the front should be as gentle and evenly sloping as possible.

The general principles governing the selection of sites for works or fortified posts in the second or retired line will be similar to those stated above. This line of works is intended as a retrenchment to the main line, in the event of any of the positions in the latter being captured, or any of the intervals being broken through. The tactical employment and requirements of the second line will be discussed more fully in another chapter, but in regard to the broad question of choosing the general line for it, it should be noted that it should be possible from it to bring a concentrated and heavy fire on any part of the outer line which has been captured, and to confront the assailants with a fresh series of works which must be carried before they can reach the object of their efforts.

The general principles which govern the selection of the line or lines of defensive works round a place to be defended have now been described. It is necessary,

however, to go into greater detail on the subject of the most suitable form under present conditions of the actual works required to make defensible any given position or locality, such as those which form the main pivots in a line of the nature described above. Before, however, we proceed to this it seems desirable to discuss at some length the method of fighting—that is to say, the organisation and tactical employment of the troops defending a fortress or great all-round defensive position. A knowledge of this will not only throw a fresh light on much that has been already said in this chapter, but it is very necessary in order to arrive at a proper conception of the many and varied requirements of a completely found and equipped fortress.

CHAPTER XIII

TACTICAL EMPLOYMENT AND ORGANISATION OF DEFENDING FORCES
—DIVISION INTO SECTIONS—INFANTRY—STRENGTH OF FIRST
LINE, SUPPORTS, AND RESERVES—GENERAL RESERVE—MOBILE
FORCE — COUNTER-ATTACK — SORTIES — ACTIVE DEFENCE —
EARTHWORKS—TACTICAL PRINCIPLES

WE have now to consider the question of the tactical employment and organisation of the defending forces. In this connection we shall do well not to concentrate our attention exclusively on the events of the recent war, but to draw inspiration also from the methods of the past great masters of the defensive art. No finer example of these can be found than the masterly tactical dispositions and organisation conceived by the Duke of Wellington for the defence of the lines of Torres Vedras. The whole of these operations, although nearly a century has passed and conditions have widely changed may still be regarded as a model of the best defensive tactics, and the history of them is deserving of the most careful study at the hands of students of the defensive art.

The following quotation¹ has already appeared in Chapter VI., but is so applicable to the points which are about to be discussed as to require no excuse for repetition.

“In appreciating the defensive power of the various portions of the line against the efforts of an invader only moderately superior to the defenders, this consideration

¹ Jones' "Sieges in Spain."

of the defender's army being a compact and manœuvring body totally independent of the works should have great weight; as in consequence, it would not have sufficed for the ultimate triumph of the assailants that a column should manœuvre successfully so as to fall on some weakly guarded point, before the defenders could be reinforced. By such a movement the assaulting force would only have lent a flank and offered the most advantageous opportunity for the attack of an army, ready to engage with it; or even should the assailants by a rapid and powerful effort have broken through any point of the line, it would have served merely to place them between an efficient army and a city, which though not fortified was assuredly far beyond a *coup-de-main*."

Again, in another place we are told that the aim of the defensive works was "to give such powers of defence and communication to every portion of the front that the army might remain concentrated in a body, keeping only detached corps of observation on its right and left, which, from the natural and artificial strength of their positions, might repel a weak or sustain a serious attack till succoured; and that at no point should a corps engage, but under the favourable circumstances of a strong front, secure flanks, facility of movement and an open but unattackable rear."

In the above extracts and in many others which have appeared in Chapter VI., may be found a clear indication of the general principle which should underlie the tactical action of the forces defending a great fortified position even in the present day. The changes in weapons since the days of Wellington have all been in favour of the defence. Long-ranging arms have made the attacker's manœuvring area so far away from

the defender's positions that it is hardly possible nowadays for the former to "manœuvre successfully so as to fall on some weakly guarded spot before it can be reinforced."

The outer line of fortified pivots may, therefore, be still more weakly held and the main body may be more concentrated and further off, conscious of the fact that by its shorter and better communications it can reinforce any threatened point long before the enemy can get an attack home upon it. The weakening of the garrisons of the fortified pivots is an advantage, as it reduces the number of men to be exposed to the artillery bombardments; in fact, the number of men actually in the trenches during the earlier phases of the combat may be very small indeed, provided there are supports under cover in the vicinity.

A large fortress or defensive position, forming a circle of from six to twelve miles' diameter and eighteen to thirty-six or more in circumference, would be far too extensive for all the troops to be directly supervised by one brain. It would, therefore, be sub-divided for purposes of command into several sections, each under the command of an officer with a suitable staff. Each section would comprise a given area or a given length of front, and all the troops operating within that area, whether temporarily or permanently, would be under the command of that officer for the time being. The extent of the various sections and the strength of their garrisons would not necessarily be all the same; they would depend almost entirely upon tactical features, as it would often be found that certain groups of works naturally fall into one command, and could not be separated without prejudice, or that the arrangement of the communications makes certain localities easily

controlled from a common centre. The last condition will, in fact, generally be the most important one, and the limiting condition will only be that no section is too extensive for control by one man.

Each section should be completely independent both tactically and as regards administration, subject, of course, to the general control of the fortress commander. To take first the tactical dispositions. Every fortified post in the front line of the section would be occupied by its own infantry garrison, the proportional strength of which will be discussed later. In rear of the works, if possible close to them and never over 300 yards distant from them, and under good cover, will be the supports, whose strength would vary according to the necessities of the case, but would generally be from a half to two-thirds of that of the garrison of the post. Then in rear again and at a central position as regards the whole section will be the local or "section" reserve. The artillery belonging to the section would usually remain either in emplacements in the front line or under cover close in rear. There might, however, be some lighter pieces with the section reserve troops. The tactics of the artillery, however, will be discussed separately later on.

The position of the section reserve would naturally form the headquarters of the section, and should be out of sight of the enemy. The troops there should be in tents or huts, and as comfortable as circumstances will allow. All the administrative departments would, in the case of a large fortress, have their sectional organisation here. Here would be the section hospital, the ordnance depot, the ammunition column or park, the supply depot, and the transport (for the conveyance to the troops in the advanced works). All these camps

and depots need not necessarily be located together, but if the space admits of it, it is better that they should be so, on account of the greater convenience in administration. Besides being out of sight of the enemy, the sectional headquarter depots should be on or near a main radial road of communication, and from the camp a road or roads should proceed to the different parts of the front line. It would be advisable to locate the sectional headquarter depot within the second line of defensive works, if such exist, but it may often not be possible to arrange for this. The sectional headquarter camp should, of course, be connected by telephone with each of the fortified positions in the defensive line, and with the fortress headquarters, and the principal departmental main depots.

The proportionate numerical strength of the sectional reserve would depend entirely upon the defensive strength of the works along the front of the section. If the latter were strong, and the means of communication to them were good and not long, the number of troops in the works, including their immediate supports, could be kept low, and the number in reserve increased. The advantage of this would be, that it would relieve as large a number of troops as possible from an exhausting and demoralising life in the advanced works under constant shell-fire. If, however, the nature of the ground made the outer defensive position a weak one, or if reinforcements could not reach them without long delays, then a considerable number of troops must be kept well up to the front, and the reserve would be proportionately less. A certain force must, however, always be held as a reserve under the section commander's immediate control, to strengthen threatened points; and it must be remembered that besides the mere garrisons

of the works, a considerable number of troops will be required to furnish the outposts in the intervals, and these will probably come from the sectional reserve.

We have dealt so far only with the section reserve, available for action in its own section only. There should also in all cases be a general reserve for the whole fortress, under the personal control of the fortress commander. This general reserve, which would be encamped or hutted in some central spot, should be of as mobile a nature as is practicable. Its object would be, not only to be thrown into the scale at a critical period of the combat, but also to undertake the more active part of the operations, such as those against the flanks of the assailants where possible, and great counter-attacks where such could reasonably be expected to succeed. It should therefore possess the power of rapid concentration at any particular point, and of rapid withdrawal from it. A large proportion of mounted infantry and also field artillery would be usefully employed with it. The general reserve would fulfil as far as possible the rôle of the army, or "compact manœuvring body independent of the works," which is referred to in the extract from Sir John Jones, quoted at the beginning of this chapter. It would, in fact, be more of a mobile field force than a mere reserve.

It will easily be seen that the existence of a powerful mobile force in reserve adds greatly to the strength of the defending side, not only in that it enables any threatened point to be strongly reinforced, but also because it permits of the fortified posts in the main line being placed further apart, and of less attention being paid to the intervals. The chances of a successful advance being made by the attacking columns through the intervals into the defended space would be small,

even if the whole of the interval were not well swept by the fire of the adjacent works. But supposing, however, that the assailants had succeeded in penetrating in this way, their fate would hardly be in doubt. Throughout their advance through the interval they would have been subject to flanking fire from the neighbouring works, and would have afforded good opportunities for counter-attacks being delivered on their flanks. When they had got through they would be confronted by a strong mobile force which would attack them either from the front or a flank, or both, and which would be further supported by the batteries and works of the second line. They would have to fight this force under the most unfavourable circumstances possible, with intact hostile works on their right and left rear. By means of the good lateral communications of the defenders, it would probably be easy, by the intervention of detachments from the works between which the attackers had passed, to cut off the retreat of the latter and prevent support reaching them. Crushing defeat and capture would, if the defending forces were properly handled, be almost inevitable. Even if the assailants' retreat were not cut off, a retirement in disorder between two intact works would be a disastrous business.

The disadvantages of the great extent of the position which has to be taken up for defence nowadays is therefore largely neutralised if a considerable portion of the defenders are kept as a mobile reserve force, as the fortified pivots may in such a case be few in number and far apart; they should, however, always be individually strong. There would be no need whatever to fritter away the garrison in an attempt to defend the whole perimeter in a continuous line or by a con-

stant succession of works; in fact, such a proceeding would be impracticable, as it would result in equal weakness everywhere and no reserve of strength.

As regards counter-attacks in force on the besiegers' positions outside the defensive line, it is very uncertain whether in the future operations of this nature would have much chance of success. We have always been taught that a defence to be successful must be of an active nature; this, however, is an axiom, the interpretation of which depends on circumstances, and one which is sometimes capable of misconstruction. When an army is on the defensive, and the conditions are such that it cannot expect assistance direct or indirect from any other force, then it is evident that a simple passive defence cannot bring about ultimate success. Something may perhaps be done by attrition, by letting the assailants exhaust themselves against the defenders' strong positions, but for final victory the defensive attitude must be abandoned for an offensive one. There is probably no example to be found in history of a defensive force achieving ultimate victory without either delivering an attack upon its assailants, or receiving assistance from the independent action of an external force. There is no better example of the truth of this than in the Boer tactics on the Tugela and elsewhere. Standing on the defensive they had every advantage, and repeated British attacks ended in discomfiture. But the Boer defence was always passive; they never exchanged that rôle for an offensive one, which would have involved throwing away all their advantages. Therefore, without any exterior strategical action of other forces to assist them, the result was inevitable. The repeated British attacks had to win through in the end.

The above, however, applies more to the case of a

field army taking up a defensive position for some temporary purpose. In a siege the case is different. Here, strategically speaking, the action is of a passive nature; for no force that is properly invested and blockaded by superior numbers can hope for ultimate deliverance except by means of an external force advancing to its relief, and forcing the besiegers to raise the siege, or else by means of the strategical results of operations in other parts of the theatre of war having the same effect. This question is more fully discussed in Chapter II. The assumption is that the defenders' line of communication is cut and their position entirely surrounded and blockaded by superior numbers. Under such circumstances it is believed that they would never succeed by means of counter-strokes in so damaging the besiegers as to force them to raise the siege, for it is reasonable to suppose that if they were not able to successfully oppose the investing movements, and prevent themselves being shut up, they would not be able to defeat the besiegers after the latter had strengthened their positions by defensive works, and the defenders themselves had suffered diminution of strength by undergoing a siege for a certain time.

Nor could a complete break-out and escape of the garrison by means of a bold attack be considered a proper termination of a siege, even if such an operation were possible. The importance of a fortress or great defensive position lies in its situation. When a force of say 30,000 is besieging another of 10,000 in a fortress it is because the latter *in that situation* forms a strategical menace or obstacle of some sort. It is the acquisition of the place that is the aim rather than that of the garrison. Therefore for the garrison to effect its own escape and abandon the place would not be to fulfil the aim of the defence, which is to prevent the enemy getting possession of the

place for a certain time. A break-out is only justifiable as a last resource, when all hopes of relief have been abandoned and failure of provisions or ammunition is the only prospect; even then it should not be done if by holding a superior force of the enemy before the place any advantage could accrue to the defender's forces elsewhere. Attempts to break out are, however, practically always hopeless enterprises if the besieger knows his business.

As we have seen, therefore, the rôle of an invested force is to hold out for as long as possible, in order to gain time for strategic action by other forces elsewhere—for instance, to stop an invasion until the national forces can be mobilised and brought up. Time is the essence of defensive action, which in itself is always of a negative character; that is to say, it is never undertaken except to permit of greater force being employed in an offensive manner elsewhere.

It may be said that time would be gained and the duration of the defence prolonged by the delivery of successful counter-strokes—not for the purpose of breaking out or ending the siege, but to harass and cause loss to the besiegers, and keep up the *moral* of the garrison. These indeed are objects which would justify such operations being undertaken; but it is very doubtful whether it would often be possible to achieve them by means of counter-attacks in force. To have really any effective bearing on the progress of the siege these must inflict very serious loss on the besieger, or permanently deprive him of some important positions; this, moreover, must be done with very little loss to the besieged. It must be remembered that the besieger's communications are presumably open, so he can make good his losses, while the besieged cannot do so; any loss to the latter therefore means a permanent diminution of strength. Moreover,

the sight of large numbers of killed and wounded being brought back may very likely be detrimental to the *moral* of the garrison, even if the counter-attack has been tactically successful. But large counter-attacks must always be accompanied by loss, generally considerable, and will seldom inflict great loss on the besiegers. As has already been pointed out the two sides exchange rôles, the defenders throw away their advantages and come out in the open, and are bound to suffer loss. The besiegers will be behind cover and will escape loss.

It is, however, too much to say that counter-attacks should be eschewed altogether. Good opportunities for dealing an effective blow may sometimes present themselves. The besieger's line may be weak somewhere, or the ground which he has to occupy may be unsuitable for defence or may permit in some places of unseen approach from the defender's lines. A powerful mobile reserve with good interior lines of communication might be able to deal a swift and effective blow before the besiegers could bring up reinforcements along their much longer exterior lines. Secrecy and rapidity would be essential. The fortress commander must be ever on the look-out for such opportunities, and swift to seize them.

Small sorties may often be effectively employed for some specific purpose, as to seize some particular work or destroy some particular guns. If the force employed is quite small, they may be undertaken by night and thus avoid loss, but they require the most skilful handling. Generally speaking, as regards counter-attacks of all sorts, it would probably be fairly correct to say that they should only be undertaken when a distinct opportunity shows itself for inflicting a severe blow or gaining some positive tactical advantage, with the corollary that no opportunity for such a gain should ever be missed. But

attacks made without such definite chances and ends, merely with the object of displaying activity, will only result in frittering away the strength and *moral* of the garrison in fruitless enterprises.

There are other ways in which defence may be active besides in actual counter-attack. Active operations with the pick and shovel are often the most fruitful and useful means by which energy can be shown. We have seen with what admirable skill and energy, and with what valuable results, Todleben employed this form of warfare at Sebastopol. One may expect with reasonable certainty that in future sieges the besiegers will resort to trench approaches as of yore. Advances over the open will have less chance of success than ever. Blockade alone is with a well-provided fortress an affair that may last out an entire campaign, and strategic considerations may necessitate the siege being raised before starvation point is reached. To completely subject a properly fortified place artillery bombardment is insufficient; close quarters are absolutely necessary for its capture, and this can only be achieved by trench approaches. To counteract these the besieged may usefully take a leaf out of Todleben's book by making counter-approaches, taking up entrenched positions to enfilade the besieger's trenches, working up to within rifle range of his batteries, &c. These methods, judiciously but energetically employed, will greatly prolong the defence. Additional works in the main defensive line, covered communications, and works of retrenchment will also always be necessary, and will give ample scope for the employment of considerable numbers from the reserve.

From many considerations, therefore, the general reserve force independent of the works should be as large as possible, the most important one being the

desirability of having a strong mobile force ready to fall on any bodies of the enemy who may have penetrated within the outer line of defence. Though it would also be used when necessary to reinforce threatened parts of the defensive line, yet such reinforcements should if possible be of a temporary nature only, the troops forming them being withdrawn again from the front as soon as the crisis that required them is past, so as to keep the reserve troops as far as possible distinct from those holding the lines of works.

It is possible to imagine that during the later stages of the siege, when the attack is being resolutely pressed, and the besieger's approaches have arrived so near the works that an assault has become possible, a large portion of the general reserve has been pushed up into the outer line of works, and will have to remain there. But a certain amount must always be retained intact in reserve under the control of the fortress commander till the very last. If the latter has no reserve left he has lost all means of influencing the combat, and will be unable to meet any fresh developments, and of two opposing commanders, he who retains to the later period an effective reserve and uses it will win the battle. The fortress commander will therefore be better advised to obtain reinforcements for hard-pressed sections of the line by taking troops from other sections where the attack is less vigorous, rather than by greatly reducing the general reserve. It will be impossible for an attack to be made equally strong all round a defensive position of considerable perimeter. On some parts the lines of investment will almost certainly be considerably farther away than on others. On those sides it will be safe to take away some of the defending troops to strengthen other threatened points.

The general reserve, in cases where the attackers' works had approached close to those of the defenders, would be usefully employed in preparing a line of retrenched works in rear of the threatened places, if that had not already been done. If an assault was expected, strong bodies of reserves should be kept, out of sight and under cover, close up behind the works threatened, so as to be able, in the event of the assault being successful and the enemy having captured any of the works, to at once deliver a vigorous counter-attack on them before they have recovered cohesion and stability. Such counter-attacks will even in the present day have an excellent chance of success, and it was by means of these that many of the assaults at Sebastopol and Plevna were finally defeated. Once the attackers are allowed to establish themselves on works they have won the task of turning them out will probably be a most difficult one, unless the defenders are fortunate enough to have a second position which commands the first one at short range in rear.

The circumstances, both physical and tactical, under which sieges will take place, will vary so greatly that it is impossible to lay down any rules for the conduct of the defence that will be universally applicable. Broadly speaking, the general principle will be to keep in hand as many of the troops as possible to the last, as far as is consistent with having in the front line of works a number sufficient to produce such a musketry fire effect as will preclude the possibility of any advance being made by the attackers over the open within effective range.

So far the dispositions which have been discussed have been those of the infantry; the tactics of the fortress artillery have now to be inquired into. This, however, will be more suitably done in another chapter.

CHAPTER XIV

TACTICAL EMPLOYMENT OF ARTILLERY IN DEFENCE—ALTERNATIVE
EMPLACEMENTS — MOBILITY — CONCEALMENT — NATURE OF
ARMAMENT — POSITIONS OF GUNS — OPEN EMBLEMMENTS
VERSUS ARMOURED CUPOLAS — SMALL QUICK-FIRING GUNS
—FIELD AND MACHINE GUNS

FOR a good example of the tactical employment of the artillery in a Land Fortress, we can hardly do better than turn to the methods and principles acted on by Todleben in his immortal defence of Sebastopol. Whenever he saw the besiegers throwing up batteries he endeavoured to estimate the number of guns they intended to put in them, and to bring up in opposition to them a greater number of his own. In other words, he always tried to obtain a superiority at the threatened point. The success of his methods was proved by the admirable defence made.

What, therefore, would be wanted to enable us to follow out the same principles in the present day? Todleben had an immense reserve of guns; we as a rule in an ordinary fortress should not; it is, therefore, necessary to be able to concentrate large numbers of the guns we have upon whatever point is the threatened one at any time. In order to achieve this all our guns should be mounted in such a manner as to be mobile, and good communications should exist between all parts of the defensive position, in order to enable them to be moved from one point to another as required.

Todleben had to construct his batteries in the

presence of the enemy, and after he had seen their dispositions; but in a fortress prepared beforehand all the emplacements should have been constructed in advance. The number of emplacements should be considerably in excess of the number of guns in the fortress, in order to enable a large number to be concentrated at any one part of the line. This will also admit of guns firing from alternative emplacements, and occasionally changing their position, which with smokeless powder will much reduce their chances of being hit.

The disposition of the fortress artillery will be different from that of the infantry. It will not usually be desirable to keep any of the heavier guns or howitzers in the centre of the defended area as a general reserve. As a general rule, it will be required to have all the heavy artillery in the front line from the very beginning of the siege, in order to crush the besieger's guns, and prevent him building batteries, so that only the shorter ranging pieces would be kept in rear. There might, however, be cases where this rule would not apply. For instance, if the defender's force of artillery were so weak that it could not hope to effect even a local superiority, then it is evident that to make any attempt to compete with the besieger's guns in the early stages of the siege would be to court destruction. Under these circumstances it would be best to withdraw the guns out of danger altogether, so as to have them available for use in the later and more critical phases, particularly in the event of an assault. They must then, of course, be put into their emplacements, and fought for all they are worth, regardless of the fire directed on them.

But even during the time they were withdrawn, under the above circumstances it would seldom be desirable to keep them so far away from the front

as the reserve troops will be, as with heavy pieces considerable delay would be incurred in getting them back to their places, and mounted in their emplacements. It would be better to keep them in well-concealed situations, or under bombproof cover in the vicinity of the front line, so that they may be rapidly taken into their places when wanted. Under normal circumstances, where the defender's artillery were not so relatively feeble as assumed above, the guns would be extremely busy during the earlier phases of the siege. The long ranging pieces would first open fire on the enemy at their longest ranges so as to force him to take cover, and to begin constructing his siege batteries at as great a distance as possible from the defensive line, and to increase as much as possible the space over which he has to painfully and laboriously advance by the slow methods of regular siege.

The defender's artillery will next endeavour, by concentrating opposite the points where the besieger is putting his guns in battery, to bring a great superiority to bear on particular points, and to crush them in detail. During this phase there will be considerable scope for intelligent tactical action on the defender's part in anticipating the movements and acts of the besiegers, in estimating on what parts of the line concentrated action would be most decisive, and what parts may be left comparatively weak. By these means a general inferiority in ordnance may be neutralised by superiority at decisive points.

In cases, however, where the defenders have a distinct inferiority of artillery to that opposed to them, they will be well advised to refrain from disclosing the position of their guns by opening fire at an early stage of the siege. An artillery duel is generally looked on as

the first occurrence that will take place in defensive operations; but although the attackers may have every inducement to at once disable the defender's guns, yet this is not nearly such an important matter from the defender's point of view, so the latter may under certain circumstances be quite justified in declining to take part in it. It is known that the besieger's artillery fire will not have any material effect on the defender's works if the latter are judiciously constructed, nor cause much loss to the men in them. It is, therefore, possible without much risk to allow him to waste his ammunition on them without attempting to reply. It is not till the later phases of the combat that the action of the defending artillery becomes of supreme importance. Then it will be required in the event of an assault to bring as heavy a fire as possible on the attacking infantry during their advance, or in the event of a trench approach to pour in fire upon the advanced trenches and render the execution of fresh works impossible. In either of the above cases the besieging artillery would generally be engaged in keeping up a fire over the heads of their own infantry upon the defender's parapets, so as to keep down the latter's infantry fire. This process must be interfered with as much as possible by sudden and accurate fire opened on the besieging artillery by the defence guns.

So important are these duties that it is imperative for the defender's guns to be intact and available for use in the last stages. If the physical features suit and the emplacements are well designed the guns may be left in position, and will in all probability not be seen. Even after they have opened fire it will in such cases probably be a long time before the attackers can locate them or silence them. They should not throw away these advan-

tages by rashly exposing themselves to disablement early in the siege, unless there is a distinct advantage to be gained by doing so.

Of course this argument only applies when the defence artillery is weak, and in all cases where a local superiority can be obtained it is well to crush the besieger's artillery as early as possible, as this will enable the defenders at the critical phases of the combat to concentrate their attention on his infantry.

To carry out the principles indicated above we require a large number of alternative emplacements, all the guns to be on travelling carriages and provided with means of transport, and that there should be good and direct communications hidden from the enemy's view. Mobility, in fact, is the chief factor.

The term mobility in regard to guns is a comparative expression. We have been accustomed in the past to associate it only with the lighter forms of artillery—the field and horse—and to consider it mainly in connection with the power to move at a gallop. A couple of years ago the idea of 5-inch and 6-inch breech-loading guns being mobile would have raised a smile. Yet the war has shown us that these can in their own degree be made mobile, that is, capable of being moved about and used in the field, and that too over distinctly unfavourable ground. In a properly prepared defensive position therefore with good metallated road communications, or perhaps railways, it would be quite possible to arrange for pieces up to this weight being moved about from place to place, in fact, travelling mountings already exist in our service for all howitzers and for guns up to 5-inch breech-loaders.

We now come to a consideration of the nature of the armament that should be employed in a fortress or great defensive position. This question would depend largely

on what nature of ordnance could be brought to the attack of the place. If the fortress were in such a situation that nothing heavier than field guns need be expected, then it would not be necessary for it to be provided with the heavier types of ordnance. But we are more prone to underrate our opponent's resources in the way of armament and his power of moving the same, than to make a mistake the other way.

Broadly speaking, the armament of a first-class fortress would consist mainly of howitzers from 5-inch calibre upwards. It would also have a certain number of long-ranging heavy breech-loading guns, such as the 6-inch, also a proportion of less powerful pieces, which should be of the quick-firing description, the 4.7-inch and long 12-pounder being the most useful sizes. What proportion the guns should be to the howitzers is a debatable question, and one that it is difficult to pronounce an opinion on. It would depend to a certain extent upon the physical features in front of the defensive position. Long range direct fire guns are required to keep the attackers at a distance, and to act upon them if they venture to come out in the open; howitzers are required to search out their trenches; drop heavy shells into their gun emplacements; break down overhead cover, and search hollow ground, reverse slopes of hills, ravines, and other places where they might find cover. Therefore, where the ground in front is considerably broken and cover rather abundant, or the conformation of the ground precludes very long ranges from the defensive position, then howitzers would with advantage predominate very considerably; where the foreground is open for a long distance, or the defensive position very commanding, the proportion of guns might be greater than in the former case. The great importance, however, of searching out the besieger's

works and breaking down overhead cover by means of high angle fire would, in the majority of cases, make it desirable to have a large proportion of the fortress armament of the howitzer class, but it must be remembered that howitzers are ineffective at ranges of under 1000 yards or so, and that for this stage of the attack guns only can be relied on. Shrapnel fire from guns is also required against attackers in the open.

The location of the emplacements for the fortress artillery will depend mainly upon the duty that each piece has to do. Generally this duty is to operate against an enemy who is attacking the main defensive pivots. By this is meant that the defence of these points rather than that of the intervals between them is the object chiefly to be aimed at, for, as has already been pointed out, an attack through the intervals need not, as a rule, be feared. At the same time means of bringing a cross fire over the intervals are not to be neglected. Certain also of the pieces, generally howitzers, will have specific duties to perform, such as to enfilade reverse slopes of hills, hollow ground or ravines, which are screened from frontal fire, and, in general, the artillery positions will be so placed as to bring a heavy fire over all the ground to be traversed by the assailants.

It is also very important that the emplacements should be in positions admitting of as much concealment as possible, or at all events of a nature to render them difficult to observe and range on; less loss would probably be suffered by guns in the open than in conspicuous emplacements. Also it is necessary that there should be easy and quite concealed means of approach by which the pieces can be brought up or removed.

The usual methods taught for disposing of artillery for action is to mass or concentrate the guns, and the

manner in which this is generally done is by putting the latter in batteries or continuous works with the emplacements in a straight line, all more or less at the same level and at equal intervals. It is obvious that concealment is hardly possible under these circumstances. The object of employing these methods is to permit of complete control and concentration of fire upon specified objects. This is, of course, of the utmost importance; but, whatever may be the case in the field, it is surely possible in prepared defensive positions, where complete telephonic communications between the guns, observing stations, and commanders can be provided, to attain this control without incurring the disadvantages caused by conspicuous batteries, and massed guns.

A greater dispersion of the guns in an artillery position has, in fact, several advantages. It renders it difficult for the attackers to concentrate their fire; it brings a converging fire from a wide arc to bear on the object specified for attack; it permits of far greater latitude in the selection of sites for emplacements and in taking advantage of the ground to obtain concealment, and it very considerably does away with the demoralising effect produced by a heavy shell fire in a comparatively small area. What is wanted, therefore, is a dispersion of the guns, but a concentration of their fire, the latter condition being attained by well-matured organisation and preparation. The emplacements may, therefore, be placed if necessary in pairs or even singly in whatever situations fulfil the conditions indicated in the previous pages.

The complete divorce of the artillery positions from those of the infantry, which was necessary when the latter were to be put in confined redoubts or forts, is no longer so now that more open and extended positions

will be taken up by both of the arms. The gun emplacements may be in the midst of the trenches or works of the infantry, provided that the control of both the arms is not interfered with, and that their respective positions are such that fire directed at the guns will not damage the infantry. What is necessary is to ensure that the attacker must devote his attention to each separately, that is to say, his objective must be dispersed.

Subject to this condition the defending artillery may, if the existence of high ground in rear admits of it, fire over the heads of their own infantry positions, or the artillery may itself be in two tiers, the direct firing guns being in advance, and the howitzers firing over them from retired positions. It may be necessary for some of the guns—for instance, those entrusted with the duty of enfilading hidden ground in front of the main positions—to be placed well to the flanks of the infantry positions, that is to say, practically in the intervals between the fortified pivots. In all such cases they require to be defended by infantry, for whom entrenched positions should be provided near them.

It is not necessary that any of the guns should be able to defend their own fronts by their own fire, as this duty can be more conveniently and effectively carried out by infantry, and to make this a condition of the siting of the guns is simply to introduce a new and unnecessary factor which will fetter the choice and probably be detrimental to the true objects of the artillery fire. A somewhat commanding position is an advantage for guns, particularly for purposes of observation. If the sites are on a hill they are, for purposes of concealment, best placed a little way down from the crest, at all events not on the sky line, provided means of access are obtainable

from the rear. It may sometimes, however, be better to put them in positions somewhat drawn back from the crest of the hill. Here they will be less easy to hit, and the guns can be more easily withdrawn, or brought up. It is probable that from such a position a good deal of the ground at the foot of the hill could not be seen, but this could generally be dealt with by pieces from another part of the position.

Howitzers, which can fire over an intervening obstacle, provided its height is not such as to intercept the projectile in its flight, and whose fire can be controlled from observing stations, can, and would usually, be placed in retired situations on the reverse slopes of hills, &c. Here they would be entirely unseen, and could hardly by any possibility be hit. Good sites for observing stations would in such a case be of the first necessity, and these must obviously be as inconspicuous as possible.

The heavy direct firing guns could also be fired in the same manner if it were considered desirable to put them in retired positions, but with low trajectory weapons such positions would be less easy to find, and such an arrangement would be almost certain to result in a considerable proportion of the ground at medium and short ranges being screened from the gun; moreover, it is undesirable to rely entirely on observing stations which may be wrecked, so it is better that nearly all the direct firing guns should be capable of being laid direct on their objects.

So far open emplacements only have been dealt with; the question of whether it is desirable to put any of the guns into steel cupolas of the sort that have been largely gone in for in some countries on the Continent, has yet to be discussed. It has been shown in this and previous chapters, that the most essential qualifi-

cations for the defence artillery are mobility and the power of concentrating a superior fire on any point by bringing up a large number of guns to any part of the defensive line. This quality is entirely forfeited if the gun is in a cupola, for it is then absolutely fixed to the one position. In return for this very great drawback, cupolas offer the advantage presumably of absolute security against shell-fire. As a matter of fact, one may be permitted to entertain a doubt as to their absolute invulnerability, for it is difficult to believe that one or two blows from high explosive shell would not at least damage some of the intricate mechanism to such an extent as to throw the gun out of action. But setting this aside, let us assume for the purpose of the argument that they are invulnerable. Is this quality worth purchasing at the cost of the entire loss of the power to move? It is difficult to believe that it can be so. The necessity for cupolas has been defended on the grounds that guns in open emplacements will be almost immediately disabled by the overwhelming effect of the attackers' high explosive shells. If this were so, doubtless it would be worth it, for one fixed and intact gun in a cupola would be worth more than several mobile but disabled guns in open emplacements. But there is no reason to suppose that the defending guns run more risk of being overwhelmed than those of the attack. The latter will also be in open emplacements, and will suffer equally from the effect of high explosive shell, of which form of projectile they cannot expect to have the monopoly. It is not reasonable to suppose that the overwhelming effect and disablement will always be on one side, nor has the attacking artillery any inherent advantage that it should be so readily assumed that it will immediately overcome that of the

defenders—at all events if the defence is organised on proper tactical principles.

This was not always the case in the past, and it is probably due to this fact that it was assumed by some writers up till quite lately that the attacking side are still tactically the stronger, as they used to be in the case of the old type of fortress.

It is easy to understand how in old-type fortresses, where the guns, mounted in high conspicuous positions, fixed, incapable of tactical movement, or of being reinforced when opposed by superior numbers, were pitted against a besieger whose pieces were in low inconspicuous earthen batteries, and were capable of movement and concentration upon any point, the silencing of the defence artillery was generally speedily achieved. Now, however, the defenders need suffer under no such disadvantages. Their emplacements also will be low and inconspicuous, more so, as a rule, than those of the besiegers. Their communications and means of movement should be far better than their opponent's, so they should possess the power of collecting superior strength upon important points. Their ranges should all be accurately known, their observing arrangements all perfected, and telephonic communications complete. Tactically, therefore, they would have nearly every advantage. In weight of metal they should not be inferior, and both sides equally would be in open emplacements, though the cover in the defence works, which were prepared in advance, should be better than in the besieger's batteries hastily thrown up in the enemy's presence, and probably under his fire. So far, therefore, from anticipating that the defence guns when in open emplacements will be knocked out at once, the conditions should, if there was anything approaching equality in the arma-

ments, be just the reverse, and the besieger be the one to suffer rapid eclipse.

Cupolas have also in themselves several positive disadvantages. Their mechanism is exceedingly complicated, and must therefore be liable to get out of order. Some of the most important land fortresses of the British Empire are in hot dry climates where dust is always prevalent, and severe sand storms occur at certain times of the year. A regular staff of mechanical experts is required to look after contrivances of this nature. Their rate of fire is also slow.

The cost also of cupolas is excessive. For the price of one gun mounted in this manner about six guns of the same power on ordinary mountings in open emplacements could be provided. The funds available for defence purposes in our Empire are necessarily limited, so it behoves us to be careful to lay it out to the best value. We should therefore look at the question from a combined tactical and financial point of view. For instance, which would be the most valuable form of armament to have for a defensive position, six guns in cupolas all in fixed positions in various parts of the line, but of which, if an attack was taking place on say one-third of the perimeter, only two of the guns would be available for use, or thirty-six guns of equal power in open emplacements, of which, owing to their being on travelling mountings, all could be brought up to oppose an attack on any particular point? It is impossible to doubt that the latter would have by far the greater value.

It may be argued that, admitting the above arguments in the case of all pieces that can be mounted so as to travel, it would still be desirable to have cupolas for a few of the very heaviest pieces too weighty to

be moved about at all. As regards this it is a question whether there are any guns likely to be used in land fortresses which cannot be rendered mobile. We know that guns up to 5-inch already have travelling carriages from which they can fire, and in view of the way in which the Boers moved guns of 6-inch calibre, it is reasonable to suppose that some form of mounting can be devised which will admit of guns of this weight even being moved by motor traction on metalled roads of easy gradient. We know, moreover, that in South Africa, railway mountings, admitting of the guns being fired direct off the trucks, were devised for 6-inch and even for 9.2-inch guns. It is evident, therefore, that pieces up to this weight can be made mobile, and nothing heavier is needed. Howitzers, of course, do not require steel cupolas, for they can be put behind the reverse slopes of hills or in other totally concealed spots, where they could not be hit except by chance.

In order that there should be no misconception, it is perhaps well to explain that in talking of heavy guns and howitzers being capable of travelling it is not necessarily meant that pieces of this nature can be rapidly moved from point to point at short notice, or change their position several times a day. In cases where a ceinture railway exists and mountings admitting of fire direct off the trucks are used the above could be done, but in all other cases, whatever means of transport are employed, the process will necessarily be a slow one, and the operations of dismounting the heaviest pieces from one emplacement and mounting in another will involve considerable labour. Yet, even if it were to take an entire night to move them to a new site only three or four miles off, this power of movement is enough

for tactical purposes, for it admits of the defender's strength being concentrated at the right points.

Rapidity of fire is a very desirable quality for defence artillery, and the adaptation of the quick-firing principle to all weights of fortress guns, including the heaviest, will be a great advantage. It has, of course, one obvious danger in the rapid expenditure of ammunition tending to exhaust the limited supply available in a fortress. This, however, is a matter of organisation. It should hardly be necessary to remark that every national fortress, and every place which at any time appears from intelligent anticipation of events to be liable to sustain a siege, should be provided with ample stores of ammunition for every eventuality. Unfortunately, our recent history shows that the national unpreparedness extends at times even to this vital requirement.

Rapid fire would not, however, be made use of except when it was evident that it would have a good effect. At certain times its value would be very great. A dozen projectiles falling in the same emplacement or trench within a couple of minutes will have a greater moral effect than a greater number doing so at longer intervals. Also the besiegers' artillery will take a certain time finding their ranges, and if the defenders, whose ranges should all be accurately known, can deliver on them during this operation a hail of accurately aimed shell from quick-firing guns, they may be able to disable their opponents almost before they have picked up the range.

In addition to the heavier types of armament which have so far been met with, it is very desirable to have for use in the later stages of the siege a number of light guns of the quick-firing class, such as the 6-pounder and 3-pounder quick-firing and the 1-pounder automatic or pom-pom. Guns of this class are, of course, useless

against earthworks, but they fulfil most useful functions during the later stages of a siege. For instance, in the event of an assault they will assist in bringing an overwhelming fire to bear, and at any time should the besieger offer, even for a few moments, a target in the open, their rapidity of working will permit of the opportunity being availed of.

If the besiegers approach the position by trenchwork a number of small calibre quick-firing guns will render even sapping impossible at short ranges, and ought to be able to render the trenches themselves untenable. In conjunction with electric searchlights they ought also to be able to entirely prevent night work. For such guns there should be a number of alternative and well-concealed positions; the principle of their employment should be surprise, combination and the taking advantage of every opportunity. If the besiegers ever venture into the open—and it is difficult to see how they can expect to capture a place if they do not—a sudden fire from concealed pom-poms will have a very demoralising effect; and against working parties throwing up siege trenches these would also be useful, so a certain number of them should be included in the armament of a fortress.

Movable steel cupolas or shielded mountings have been invented for guns of the small quick-firing type, and it is probable that they would be very useful, for in the close stages of the combat a heavy rifle fire may be expected from the besieger's trenches upon any guns which show themselves. Such forms of cupola would not have the defects noted in the case of large fixed cupolas, for they are simple in construction and capable of fairly rapid movement. Some forms are made which travel on rails, and others on ordinary wheels for horse traction on roads.

A number of 15-pounder field guns could also be most usefully employed in the defence of a fortress. They need not be assigned to any particular positions, but might be kept with the reserve troops, and pushed up into any part of the front line where they were required.

The rifle-calibre machine gun does not, properly speaking, come under the head of artillery, but this seems to be the best place to discuss it. Whatever may be the opinions held as to the value of this class of weapon with infantry or cavalry in the field, there can be no doubt that in a fortified position they will fulfil a most useful purpose. With the parapet form of mounting, which enables them to be fired over any infantry parapet and yet admits of their being moved about, they can be kept totally concealed when not in use, and even when in the act of firing afford so small a target as to be hardly visible. A few such weapons in an entrenched position permit of the greater part of the garrison being kept well under cover, for in the event of assault they enable a heavy fire to be immediately developed by their attendants. In the defence of a flank, in positions where a line of infantry would be visible and liable to enfilade fire, a single machine gun judiciously posted behind a bush or rocks or in a small pit could entirely escape detection. To cover particular points such as a bridge, or ford, they are also most valuable. Every fortress, therefore, should be equipped with a good number of these useful weapons. Each infantry work should have some told off to it, and there should also be a number in reserve.

CHAPTER XV

DESIGN OF INFANTRY WORKS—OBJECTS AIMED AT—FORMS OF COVER — AVOIDANCE OF SHELL TRAPS — UNDERGROUND SHELTER—TRACE OF TRENCHES—POSITIONS OF TRENCHES—MEANS OF ACCESS—COVER FOR SUPPORTS—DRAINAGE—HOUSES OR VILLAGES IN A DEFENSIVE LINE—WOODS—CLEARING FOREGROUND—TELEPHONIC COMMUNICATION—OBSTACLES—PARAMOUNT IMPORTANCE OF INVISIBILITY—HOW OBTAINED—SELECTION OF DEFENSIVE POSITION GENERALLY—FLANKS—INTERVALS—ALL-ROUND DEFENCE—ADVANCED WORKS—SECOND LINE

As regards the actual design of the works themselves, it is undesirable to do more than indicate general principles. The laying down of type designs has as a rule a mischievous effect, for it tends to discourage the designer from thinking for himself, and adapting the work to the circumstances of the case. Moreover, physical and other conditions vary to so great a degree in different cases that no types could be shown to suit all. At the same time it is difficult to express one's meaning or illustrate principles without diagrams of some sort, so in this chapter will be found a few, which should, however, be regarded only in the light of illustrations of what is written, and not as types to be followed under all conditions.

We are assuming that the general line of defence round the town or place has been selected, and also that the positions of the various fortified pivots in that line have been decided on. The general principles on which this will

have been done have been described in the previous chapters. The sites proposed for fortified pivots are probably either ridges, or groups of hills, or some other well-defined features capable of defence. It has already been stated in Chapter XII. that the defences of the pivots will probably not in future take the form of redoubts or forts, but that the localities will be rendered defensive by skilful treatment of the ground. Each position will therefore comprise a certain area of ground, perhaps rather a large one, which has to be rendered into a miniature fortress by means of defensive works. The method in which this will be done will of course depend upon the local conditions, but will generally consist, as already mentioned, in constructing at suitable points small simple trench-like works for infantry and emplacements for guns.

There are three general objects to be aimed at in preparing a given area for defence, and each of the three is equally important. It is required to obtain the utmost development of fire to the front and to a somewhat less degree to the flanks; to arrange the works so that they offer as shallow a target to the enemy as possible, and to render them inconspicuous and difficult to distinguish; lastly, to permit of rapid and covered communication from each work or part of the defensive line to the rear, so that supports may be brought up with the utmost rapidity.

Along certain parts of the defensible ground, whence a good field of fire in the required direction can be obtained, will be constructed lines of infantry parapet with cover in rear, connected by covered ways, perhaps with each other and certainly with the rear. On suitable positions for artillery fire will be constructed the emplacements for the guns, also with communications to

the rear. The selection of both these infantry and guns' positions will be governed by the three main principles stated above.

There should seldom be any clashing between artillery and infantry claims to a particular site, for the duties of the two arms are different, so the requirements of their positions will usually be dissimilar; but if any dispute arises as to whether guns or infantry should occupy any particular site, the way to settle it is to consider, not which arm that site is most suited for, but which form of fire it is most important to have at that particular point. Generally (though not always) it will be found that infantry fire is the more essential, for it must always be remembered that rifle fire forms the bedrock of all defence and that artillery is but an accessory—a highly important one, but still never more than an accessory. It will generally also be found possible to find another site for guns from which the same, or nearly the same, effect can be produced as from the point under dispute, while it may sometimes be dangerous to leave it without infantry defence.

The position of guns generally should be sufficiently removed from that of infantry to prevent loss to the latter from fire directed at the former. Another reason for a certain amount of separation is that control is difficult when different arms are crowded together.

We will begin by a consideration of the nature of the works intended for infantry. To permit of full scope for the defender's rifle fire, all that is needed is a simple parapet to fire over. In trace this should follow the contour of the ground, and would therefore seldom be quite straight and never on any geometrical plan. The general direction in which the parapet would face would naturally be in accordance with the direction of the

object upon which it is intended that it should bring a fire.

The height of the crest of the parapet above the natural ground will be so fixed as to see over as much as possible of the ground in front. If the latter has hollows or is concave in section, the crest has to be raised to see down the hollow parts; if it is flat or of uniform slope, it may be but a foot or two above the natural ground, just enough to permit of view over the grass or stones with which the surface may be clothed. For purposes, however, of concealment, which is generally all-important, it is necessary to keep the crest as low as possible, so the condition mentioned above of seeing into all hollow ground, &c., will generally have to be partially sacrificed for this. This condition can, moreover, as a rule be to a certain extent complied with by the judicious location of the position of the work, that is, by placing it forward or backward on the slope of the hillside at whatever point gives the best view over the ground in front. In ordinary country there will seldom or never be any place (except in a balloon) whence all the ground within rifle range can be seen, so the question becomes one of compromise and balancing of advantages and disadvantages. This question will be dealt with in more detail later, but it should for purposes of invisibility be kept as low as is compatible with a certain amount of view to the front.

The interior slope of the parapet should be revetted vertical or as nearly as possible so, though in times of peace there is little objection to leaving it at a natural slope and cutting it vertical on the outbreak of war, as this makes maintenance easier. At every two or three yards' interval in the parapet there should be recesses for ammunition. The banquettes, or path the firing line

stand on, should be 4 feet below the crest of the parapet or 4 feet 6 inches if an elbow recess is provided. It is generally made 5 feet or 6 feet wide, which admits of men passing each other, but better cover would be obtained by making it only 2 feet or 1 foot 6 inches wide, and then a drop of 2 feet 6 inches on to a pathway 5 feet or 6 feet wide. Men firing would stand on a

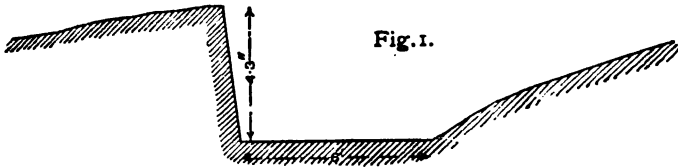


Fig. 1.

Sections of Parapets

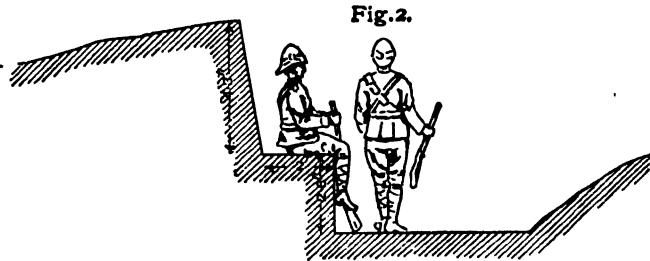


Fig. 2.

narrow banquette or step, and men passing in rear would have 6 feet 6 inches of cover. Under rifle or shrapnel fire complete cover would be obtained by sitting on the top step with the back to the parapet. The step should be strongly revetted, so as not to break down under constant use; in permanent works concrete or masonry would be employed. If this were done there would be no objection to this step being 2 feet 6 inches high, as shown in the above sections, for this is not really too high for men

to jump on to. It would be possible to break the fall into two steps, but this would be encroaching on the 5 feet path, and people passing along would have to keep further out and have less cover. The arrangement as illustrated in Fig. 2 is better.

For protection against frontal fire of shrapnel or rifles the above is quite sufficient; men behind such parapets could not be hit except when actually firing. For this period, however, some form of head-cover would be necessary, otherwise the defenders might be absolutely prevented from manning the parapet for firing purposes by a heavy fire of musketry and shrapnel. Sandbags make good head-cover but are conspicuous, and shooting at the shorter ranges is so accurate nowadays that regular loop-holed cover is generally required. Some form of continuous head-cover with pierced openings seems suitable, but care must be taken to make the holes small, and the whole thing inconspicuous. At Mafeking steel loopholes were made of two pieces of half-inch steel bolted together at an angle, with a hole 2 inches square in the middle of the joint, the shield being 2 feet high and 2 wide. This was adopted because it was found that the Boers put bullets through sandbag loopholes from short ranges.

In order that high explosive shell from howitzers may not damage the defenders who are manning a parapet or sitting tight behind it, it is necessary that there should be nothing in rear which should catch the shell and explode it, or act as a stop butt, for in this case the back blast or all-round effect would cause loss. The ideal arrangement would be to have the parapet in such a position that all shells just missing the crest would pass clear away into space. But this could very seldom be arranged as it would usually entail having the parapet on the sky line when viewed from the enemy's position,

? so that the defenders' heads would be conspicuously visible. It should, however, always be arranged that there is no steeply rising ground or bank close behind the parapet, as this would catch and burst shells. High explosive shells have considerable all-round effect, and if burst behind the parapet in this way would probably cause loss, and certainly considerably demoralise the defenders.

For this reason most existing redoubts and forts are regular shell traps by reason of the *parados*, or interior mound, which exists in nearly all of them. Even the Twydall type of redoubt, referred to and illustrated in Chapter X., has this defect—it having been designed before the introduction of high explosives. The object of the *parados* was in some cases to give a background for the heads of the defenders of the front parapet, and to provide cover for casemates, magazines, &c., and also to protect the defenders of the gorge of the redoubt from reverse fire.

In the present day regular closed redoubts are not required, so protection for the defenders of the gorge is unnecessary. If it were desired to provide a firing line facing towards the interior of the fortress it would be at a distance off, and probably behind the reverse of the hill, or in some other place hidden from the front. Magazine accommodation is also not necessary. Rifle ammunition is best placed in recesses distributed all along the front, close to the parapet, and these would be replenished from an intermediate depot in rear of the works; this might be in any weather-proof building out of sight, for cordite is not liable to be exploded by the enemy's shell. Artillery ammunition will be stored near each gun emplacement. Casemate accommodation will be discussed later, but it does not require a *parados*. A background for

the heads of the parapet defenders would usually be provided by the natural ground in rear, that is to say, by placing the parapet somewhat forward of the crest of the hill. Where this cannot be done it may be necessary to provide it artificially. In such cases it should be placed some distance away from the parapet, not less, if possible, than 150 feet, and its front slope should be very gently sloping. Occasionally it may happen that the necessary background could be obtained by planting trees or shrubs or even a hedge—that is, when time admits of their growth. Plantations made for this purpose should be laid out in an irregular and natural manner, and not in stiff rows or straight lines.

It is not sufficient for protection against shell fire, particularly of howitzers, merely to avoid catching the shells just behind the parapet. Hits on the parapet close to the crest will cause loss, and will break down the parapet and expose the men behind. Also it will not be always possible to prevent the defenders' position from being to a certain extent commanded or seen into. To protect the defenders against this, and also against oblique or enfilade fire, overhead cover of some sort should always be provided unless the exigencies of time absolutely prevent it.

It is not, however, necessary that this shelter should be of a very massive or elaborate description. It is very doubtful whether it would ever be necessary to make the cover of a strength sufficient to resist bombardment. It is evident that if the shelter is made completely underground, and the earth above it is made to exactly resemble the surrounding ground, it will be impossible to locate its position, or to drop successive shells upon it. The utmost it would have to fear would be a chance hit.

The shelter, also, may be small in area; it is only

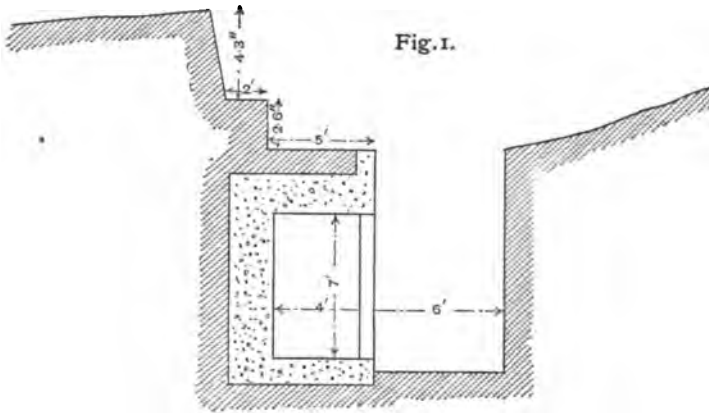
required to accommodate the men in the firing line, for the supports will be in another shelter in rear. It should be as close to the parapet as possible, and there should be steps or ramps for rapid access to the parapets, so that the latter can be manned at the shortest possible notice. If time and materials do not admit of covered-in shelters being provided, a deep, narrow trench will give fair security.

From the section of the Boer trenches, shown in Chapter XI., a useful hint may be obtained as to a suitable design for shelters behind the parapet. We have seen how the Boers in their deep, narrow trenches, hollowed out at the bottom, were well secured from the British artillery fire. Our shelter behind the parapet may, therefore, take the form of a narrow, deep trench recessed on the side next the enemy; this recess, which need not be more than four feet wide, would form the shelter for the defenders, the trench forming a lateral means of communication in rear of the parapet.

The cover afforded in shelters of the type described above, and shown in Fig. 1 of the accompanying illustration, would be quite good enough, for it is evident that a projectile coming more or less straight from the front could not possibly fall so as to just miss the crest and hit the rear edge of the trench. If the parapet were in such a position that very oblique fire were expected, then the trench might be brought close into the parapet, somewhat as shown in Fig. 2, and this would make the shelters quite secure; but it is probable that even against oblique fire the arrangement in Fig. 1 would give ample cover, particularly if the trench were constructed in comparatively short lengths.

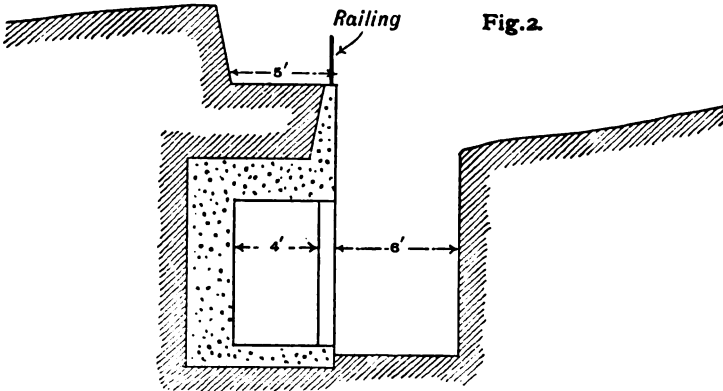
The walls and roof of the shelter could in a permanent work be of concrete or masonry, and this could be

made of any desired thickness at the outer edge if it were thought necessary to guard against accurate bombarding



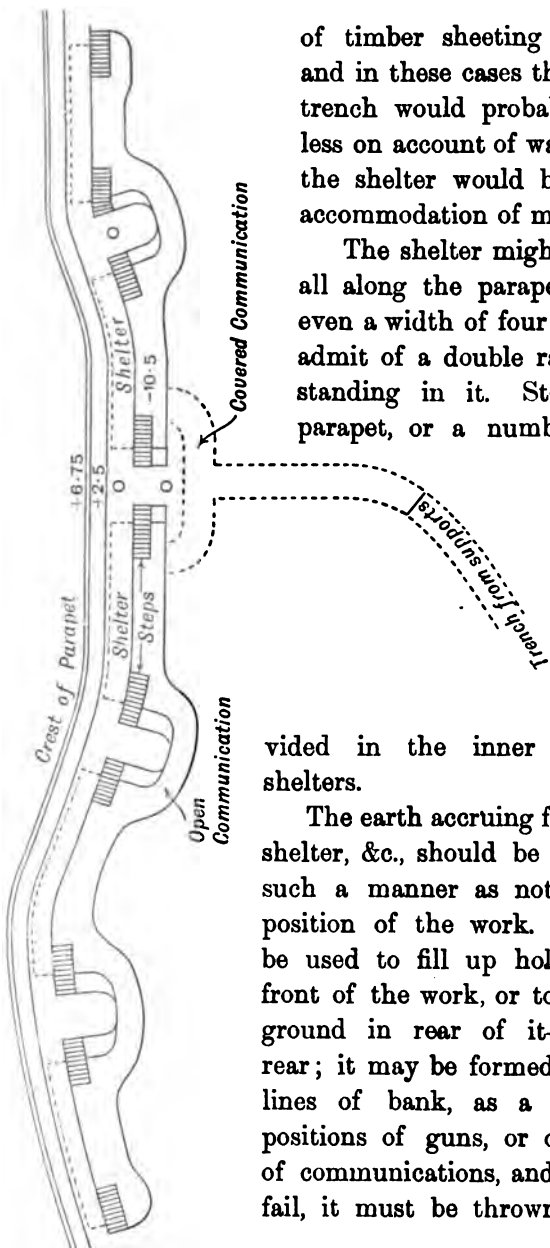
Shelters under Parapet

Means of access to parapets (not shewn) are most important.



fire, as, for instance, in cases where the work was very conspicuous. In hastily thrown up field works they would be

PLAN OF INFANTRY PARAPET AND TRENCH.



of timber sheeting and standards and in these cases the depth of the trench would probably have to be less on account of want of time, and the shelter would be only for the accommodation of men sitting.

The shelter might be continuous all along the parapet if necessary; even a width of four feet only would admit of a double rank of infantry standing in it. Steps up to the parapet, or a number of ladders,

should always be provided.

At frequent intervals recesses or cupboards for small-arm ammunition should be provided in the inner walls of the shelters.

The earth accruing from the trench, shelter, &c., should be disposed of in such a manner as not to betray the position of the work. It may often be used to fill up hollow ground in front of the work, or to make a back-ground in rear of it—well to the rear; it may be formed in continuous lines of bank, as a screen to the positions of guns, or of supports, or of communications, and if other uses fail, it must be thrown into ravines,

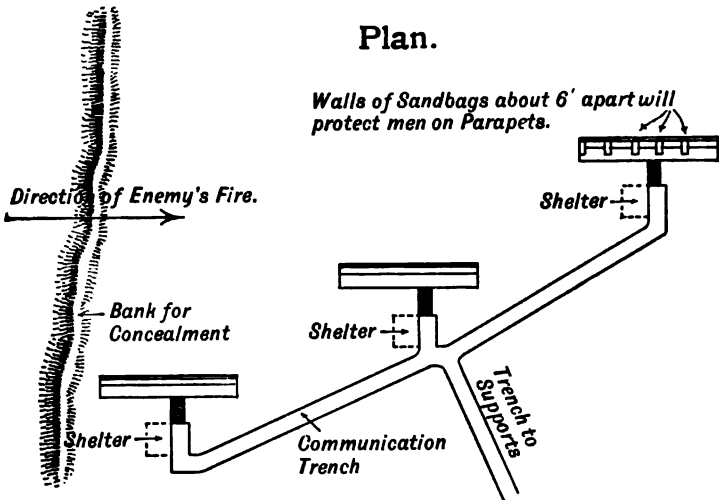
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or spread over the ground all about. On no account should the parapet be made conspicuous, or higher than is absolutely necessary merely in order to use up the earth.

The forms of works described above are intended merely as suggestions; they would be very considerably modified according to circumstances. The amount of covered shelter shown is only that which is actually necessary for protection against fire, but, in view of the fact that troops might have to occupy these trenches for lengthened periods, it would be very desirable, in the case of works constructed deliberately in peace time, to provide at intervals more commodious shelters in which the troops might take their meals and the reliefs sleep at night, or portions of the trench itself might be entirely covered over so as to give complete security. On the other hand, in hasty field works, it might only be possible to provide shelters to accommodate men sitting. In all cases the chief points to be borne in mind are to make the works as shallow as possible from front to rear, with low command and general invisibility. Means of rapidly manning the parapet are also essential.

In tracing lines of parapet, regard must be paid to the direction in which it is intended that the fire should be directed, and they should be as far as possible at right angles to it. The straighter the line the more powerful will be the fire obtained, that is to say, angles and sharp curves are a source of weakness, but it should not, as a rule, be an absolutely straight line, as this would be more visible than if it followed the contours of the ground. Making the parapet in short lengths will facilitate its adaptation to the ground, and in any case the sunk trench and shelter should be in quite

short lengths, particularly if oblique fire is anticipated, in order to localise the effect of shells which burst in it. Lateral communication need not be sacrificed by this, as the trench may continue round a piece of natural ground left as a traverse, as shown in the illustration. If possible, the length of any distinct independent piece of parapet should be such as to be suitable to be



TRENCHES EXPOSED TO ENFILADE FIRE.

garrisoned by a distinct unit, such as a half company, section, or squad. The method of estimating the strength of the firing line will be shown in Chapter XVI.

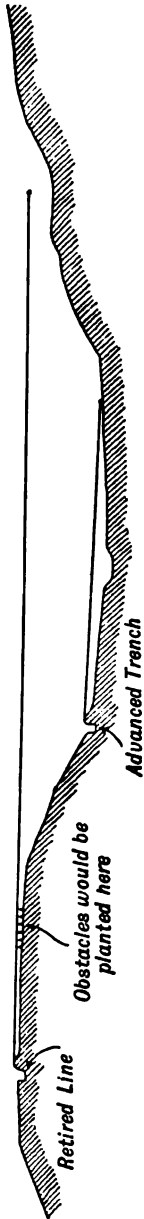
In places where enfilade fire may be expected, as will generally be the case on the flanks of a position, it will be best, wherever possible, to obtain concealment from the direction from which the hostile fire will come by placing the infantry parapets in such a position that natural features, such as hills or woods, lie between the works and the directions from which the enfilade fire

may be expected, so that they can only be hit by chance. With the comparatively large areas which will generally be available for choice of positions, it will often be possible to arrange this. Where, however, natural features do not admit of this, the parapets should be kept as low and invisible as possible, and should be traced in short lengths, arranged in echelon, so that the enfilading fire will only rake short lengths. Artificial mounds to give cover from the fire are not recommended, as they will generally only form a mark for the enemy's artillery, but continuous lengths of earth-bank at right angles to the parapets will, if the latter are in echelon, in short lengths, sometimes give concealment. In positions prepared in peace time, trees and shrubs may be planted to hide such works. Where works are visible from an enfilading direction, it will hardly ever be possible to protect the men when actually at the parapets, but cover can easily be provided for them in shelters. These should be at right angles to the parapet with their backs to the direction of the hostile fire, and the short lengths of parapet being in echelon, communication from one to another can be got by oblique trench approaches.

Parapets will occasionally be in positions where they cannot be subjected to artillery fire, as in retired positions, and second or retrenched lines; in such cases no underground shelters are necessary, but only a trench behind the parapet giving shelter against rifle fire. Concealment, also, is generally not necessary in these, so they may be given a higher command.

The selection of the exact position of infantry parapets, how far forward or backward, is a matter of considerable importance. If the defensive position is on a hill it will generally be difficult, if not impos-

WORKS RETIRED AND ADVANCED.



Section.

sible, to find any spot at or near the top whence all the ground in front both near and far may be seen, except in a position greatly exposed to view and fire. Often the best situation will be at the bottom of the hill slopes, at or near its junction with the plain in front; from these a sweeping fire can be brought over the latter, and trenches in such a position can probably be well concealed. Or it may be advantageous to give two lines of trench, one low down the hill as above, and another firing over it at the distant ground from the top of the hill. The latter may in such cases often be drawn well back from the actual front crest of the hill, and this will generally assist invisibility. The attackers of such a work, if they had captured the advanced trench and climbed the hill, would still have to advance a certain distance over the flat open top, under heavy fire at short range. The chance of such an attack being successful under the terrific density of fire that can be developed from modern magazine rifles is very remote, and this retired position would have a further advantage in that its supports could be kept close up in rear on the reverse slope of the hill. It is generally extremely demoralis-

ing to an attacking force, who have laboriously and after fighting and loss climbed a steep hill, to find themselves opposed at two or three hundred yards' range by a well-entrenched force—witness the case of Spion Kop—and the effect is much enhanced if the position of the defenders was previously unsuspected.

There is one considerable difficulty attending the location of lines of parapet in a forward position low down a hillside, and that is in the provision of concealed means of access to them and of shelter for the supports. Where the works are hastily thrown up in anticipation of an early attack it will be hardly possible to provide for these at all, and the use of works in such positions should in such circumstances be avoided as far as possible. Where such works are absolutely necessary, and also in cases of other advanced isolated works where covered approaches cannot be constructed, the defenders, who must be in more than the usual strength, must take their posts under cover of darkness, and must take with them food, water, and ammunition for the whole day, for it will be impossible to reinforce them under fire or to relieve them except at night.

Where, however, the works are constructed some time before attack is expected, oblique approach trenches can often be provided, and this should be done wherever possible, but the configuration of the ground may sometimes forbid it. In permanent works completely covered passages of approach may be provided. They need not be bombproof if they are sunk below ground level and the earth covering made to resemble the surrounding ground, but if the works are far down a hillside, the great length of approach that would be necessary would make this costly and otherwise objectionable.

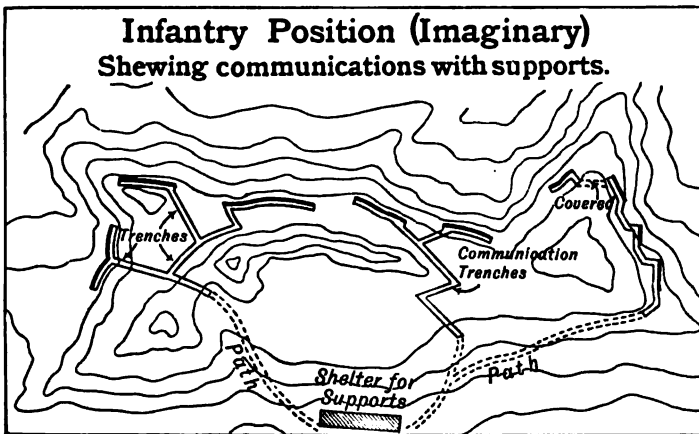
The provision of suitable shelter for the supports is

a most important matter. If sheltered ground to the rear of the works exists this may be merely ordinary weather-proof covering, or in hasty defences it need not be even that. It should not, if possible, be exactly in rear of the artillery or infantry positions unless some considerable natural obstacle intervenes, as the supporting troops would then suffer loss from the "overs" of the fire directed at the works. The best place for supports is on the reverse of a steeply sloping hill. When good natural cover for supports does not exist, it may be necessary to provide artificial splinter-proof shelters, kept low and well concealed, or even in extreme cases to provide bombproofs, but the latter would only be necessary where the site was most exposed and unsuitable for defence.

The general position of the supports should be such that access to any of the infantry works can be had rapidly. The distance in rear will depend on the likelihood of attack in force being suddenly developed. If shelters exist under the parapets of the works, supports may be from 100 to 250 yards in rear, but there may be certain points where from the shortness of the field of view an attack might be suddenly made, and these may require special local supports close at hand. Actually, though the word supports is used to distinguish them from the sectional reserves, the troops under reference would be a sort of local reserve, the immediate supports of the parapet defenders, *i.e.* the men to replace casualties, &c., being kept in the shelters under the parapet.

Good communications from the supports' positions to the infantry trenches are necessary. To conceal these, existing cover, such as hedgerows, or banks, or hills, would be utilised and paths cut if necessary in rear

of them, but where it is necessary to pass over ground seen by the enemy, oblique trenches must be provided. In very exposed places, as has already been mentioned, roofed passages may have to be resorted to. The trench communications should be laid out so as not to be enfiladed; they should not be straight except for short lengths, so that the effect of a shell falling in one may be localised. Each separate length of parapet in any given defended position should be numbered for identification,



and direction boards put up in the communicating trenches showing the way to each. This is to enable the supports to find their way to where they are wanted.

It is unfortunate that the conditions of modern warfare require that defensive works should be deeply sunk in the ground, for it makes the drainage of them a matter of difficulty. This point, however, is of great importance and must be attended to, as otherwise the trenches and works may be so flooded by storms as to become untenable. In permanent works drainage

can be arranged for with the construction of the works, and it only remains to ensure that the drains do not get silted up. In hasty works it will be a matter of great labour. In porous soil it may be possible to lead the drainage only a short distance into soak-away pits, filled with stones, &c., but where this cannot be done, and where to carry away the drainage to lower ground would involve too great a length of drain, then good-sized pits or tanks should be provided into which the works or trenches would drain, the water being pumped out when necessary from the tanks on to the ground outside. Hand-pumps should in such cases be kept in the works, and men told off to use them directly it is necessary. Arrangements should of course be made, by means of catch drains and small banks, that no surface water from the ground outside flows into the trenches, so that the drainage of the latter would only have to deal with the rain that actually fell in them.

Telephonic communication should if possible be provided between the position of the supports and each of the principal infantry trenches or groups of trenches, and also from the former to the post of the section commander in rear. The utility of these in the event of attack is obvious.

No mention has been made so far of obstacles. With an open field of fire entrenched troops with magazine rifles and plenty of ammunition do not require the aid of obstacles to enable them to stop the most determined attack. Even at Plevna the Turks with single-loading rifles stopped the Russian assaults solely by the density of fire and without any obstacles. The latter were a necessity in muzzle-loading days, as the rate of fire was so slow and the dangerous zone so short that it was important to delay the attackers under fire.

There is no such absolute necessity now. Still, they would always add considerably to the strength of a position, and there may be places where obstacles are required, namely, where a work is retired behind the brow of a hill so that the field of fire is short, or to delay troops at certain points where a very heavy fire cannot be brought to bear on them, such as at the passage of a bridge or ford, in a defile, &c.

It is usually necessary when a position has been fortified in peace time to enclose it in some way so as to exclude unauthorised persons, &c. This enclosure might be made into an obstacle. A single or double line of barbed wire fence would answer well. Gates or other means of getting through it must be provided, in case counter-attack is required.

Obstacles should be concealed from the enemy by being sunk. This will prevent his destroying them by artillery fire. Also, it is disconcerting to an attacking force to come suddenly upon an unsuspected obstacle.

Clearing of the foreground in front of the infantry parapets is important, but of course it will generally be impossible to get rid of all cover within the effective range of modern rifles. As much as possible should, however, be done, beginning near the work and proceeding outwards. If possible the clearance should extend to at least 800 yards from the parapet. The demolition of every house or village in front of the defender's works is not so important nowadays as it used to be; the attackers will not be able to use buildings as positions for their infantry, as a few rounds from the defence howitzers would bring them down in ruins on their occupants. They should, however, be removed if concealment could be obtained in rear of them for the attacker's columns.

Houses or villages which exist within a defensive line will seldom be of any use from a defensive point of view. If occupied they would offer most easy targets for concentrated artillery fire, and the destructive effect on buildings of modern high explosive shell is so great that they would bring ruin on any troops within them. It would generally be safe to ignore them altogether, as the reasons that make them unsuitable for the defenders to occupy would also make them objects of little temptation to an attacker, who would similarly be unable to hold them under the defender's fire. If it were really necessary to deny to the attackers the ground occupied by buildings, it would be best to put the defenders in trenches outside, well clear of splinters or fragments of stone, but in a position to bring fire over the approaches to the buildings. In places, however, where artillery could not be brought to bear a group of strong buildings could be easily made into an excellent defensive position. The method of treating it is shown in the official manuals. Isolated walls or walled enclosures without roofs, if thick enough to resist rifle and shrapnel bullets, are useful, for they cannot be damaged except by a direct shell hit, and even then only a short length will be blown down. They afford, however, a good target.

Woods are not very useful under modern conditions. If it is known that the front edge is held, so good a target is offered that a very heavy fire can be concentrated on it. The interior of a wood certainly gives concealment, but great labour is involved in preparing a defensive position there and forming a field of fire, obstacles, and communications. Such a position gives no fire outside the wood to the front. If a wood is in front of the defensive line its rear edge should be entangled and positions taken up from which a fire can be

brought to bear on troops issuing from it. Generally speaking, a wood in a defensive position is a source of weakness, and works should be arranged if possible to bring a heavy fire over the ground in front of them so as to prevent the enemy getting into them. It may sometimes be possible to have the front line of the wood, or a position just inside the front edge, prepared for defence, but the defending troops kept concealed in rear, and only brought up when an infantry attack develops, and the enemy's artillery fire must to a considerable extent cease. Communications will in such cases be necessary.

The absolute necessity for rendering all the works invisible from a distance, or of misleading the enemy as to their situation, has already been repeatedly pointed out. The method of doing so will be dependent entirely on the nature of the ground. Low commands are necessary, and also, as a rule, some kind of background. Smooth turfed slopes are quite inadmissible, and the ends of parapets or banks as seen from the front should be gently sloping and blended into the ground. Steep frontal slopes are also generally easily visible, so all should be gentle and irregular. The surface of all disturbed soil, such as parapets, &c., should be made to resemble the surrounding ground. If the latter is grass it should be grassed, if cultivated there should be cultivation right up to the crest of the parapet and again on the background. If the country is bare and barren, with rocks and shrubs, similar features must be reproduced on the parapets. Shrubs or bushes on an infantry parapet, if not too close together, will not obstruct the defenders' fire. It must be remembered that with modern rifles the defenders may be several paces apart, so they can take up positions where they can see

between the bushes. Such bushes, however, will make it much harder for the enemy to discover the defenders, and even guns can be concealed in this manner.

When a position is prepared in peace time there should be no difficulty in obtaining complete invisibility by judicious planting and cultivation, &c., but in hasty works it will often be difficult to conceal freshly turned earth. But it must be done, either by keeping the sods and placing them on the top, by covering with grass, brushwood, or other materials, or by some other means. The surplus earth may also be formed into sham parapets elsewhere to mislead the attackers.

When planning the methods to be employed for concealing a position, or for locating the works so as to obtain invisibility, it is essential that the designer should go out to the positions that would be occupied by the enemy and carefully examine the aspect of the defensive position from there, noting the appearance and colour of the surface of the ground, the arrangement of the background, &c., and thus decide on the effects he should try to produce. More can be learnt by this means than by any other.

The same argument applies to the selection of the defensive position generally and to the design and location of the works. It is most necessary that the designer should traverse and carefully examine the whole of the ground which the attackers would occupy and that over which they must advance. The points on which the latter's siege batteries could advantageously be placed for bombarding purposes should be noted, as arrangements must be made for securing a preponderance in guns for the defensive positions opposed to these. The attacker's communications, both lateral and from front to rear, should be carefully studied, as they will indicate the

points on which he can the most easily concentrate his forces, and thus point to the measures that must be taken to oppose them. All ground hidden from the defence position should be noted, and the possibility of bringing on it an enfilade or indirect fire from other parts of the defender's line ascertained. The facilities for attack or for execution of trench work by the enemy will thus be discovered, and the visibility or otherwise of the proposed sites for defensive works made evident. Much valuable information will be obtained in this way which could never be got from a study only of the defender's ground.

The above procedure will also make plain what parts of a defensive line may be safely neglected and what parts must be held in strength. Generally speaking, portions naturally strong may be left more or less undefended, while weak points require special treatment. For instance, suppose the line to be defended has a length of ridge or hill with gently sloping open ground in front of it, and on the flanks of this broken and rough ground with ravines, &c. If looked at from the defender's point of view only, the temptation will be to hold the ridge with open ground in front as it so eminently lends itself to defence. But if looked at from the attacker's point of view it will be at once evident that the latter would never make his advance on this part over ground where he would be at such disadvantage, but would direct his attention to the broken ground on the flanks, where he might hope to make part of his advance under cover. The open easily defensible portion may therefore be neglected, and the broken ground, though far less favourable for defence, must be most carefully defended. There would be no harm in having a line of shelter trench on the open ridge, as it could be occupied if required, and at

other times might draw the enemy's fire, but in calculating the garrison this need not be taken into account.

Again, it will be seen that a strongly held position completely secures the ground on both sides of it as far as rifle range from its flank works extends. Thus the interval between two strongly held positions may be practically neglected, for the attacker will be under no temptation to try and push his way through the interval, only to have to fight a mobile reserve in rear, or to have to force a second line of works while under the liability of having his retreat cut off. This point has been more fully discussed in Chapter XIII. Practically it means that the utmost development of fire to front and flanks should be obtained from the positions selected to be held as pivots, while the intervals may generally take care of themselves.

Similarly, when the flank of a line of defence is secured by some impassable feature, such as the sea, an unfordable river, or a marsh, then a fortified position 1500 or 2000 yards distant from the impassable object will, if the ground between is even fairly open, completely secure the interval. In the same way as in the above case an attacker would be under no temptation to pass through this interval without capturing the neighbouring work, for even if he escaped severe loss from the flank fire brought on him from the work while passing through, he would be exposed to prompt attack from the reserves inside, and would in all probability have his retreat cut off.

Of course, the intervals in all cases such as the above should not contain any point which, if the enemy obtained possession of it, would give him a position whence he could command or enfilade the neighbouring works, or the town or place defended, without being liable

to concentrated fire himself. But this is only tantamount to saying that the positions of the fortified pivots must be judiciously chosen.

The question is often asked, whether the fortified pivots in the main line of defence should be prepared for all-round defence. This, of course, depends entirely on what the chances are of receiving an attack from a point between the line of defence and the town or place defended. In cases where the fortified pivots support each other well, and where it may be expected that a strong mobile reserve will exist within the fortified area—as it always should do—then the chances of attack from that quarter are very remote. It is sometimes said that the attackers may pass through an interval by a night march and work round to the rear of one of the main pivots, but all practical soldiers know that complicated movements of this nature by night in the close vicinity of a vigilant enemy are totally impracticable. In any case, it is difficult to see how artillery could be brought against the rear of the positions in the front line, and it is probable that the utmost that would be necessary in the way of rear defence would be shelter trenches, which could be thrown up during the siege. They must, of course, be hidden from the front. It is also better to do without defences facing to the rear, in order that if the besiegers capture the position they will not find ready made for them cover from the fire which will be brought to bear on them from interior positions, and ready-made trenches in which they can resist counter-attacks.

The case is different if the fortified pivot is isolated or far advanced to the front, or even ill-supported by its neighbours. In such cases there might be possibilities of detachments of the enemy working round in rear,

so parapets and shelters facing that way should be provided, and also perhaps some emplacements for guns.

Advanced positions in front of the main line of defence often are of considerable value in delaying the besieger's progress and prolonging the defence. They form good pivots for the outpost line; they force the besiegers to deploy or to commence their siege works at a much greater distance from the place; they may even possibly necessitate a regular formal attack being undertaken against themselves before the besieger can turn his attention to the main works. They cause in fact delay, which is of priceless value in a siege. Many instances of the successful use of advanced works can be found in history, and the cases of Bavilliers and Danjoutin before Belfort will readily occur to mind.

In the present day such positions would not be villages but probably hills or elevated ground. They should be selected so as to necessarily force the besiegers to stay their advance till they are taken. They should be proof against assault over the open, and the communications to them from the main position should be secure and hidden, so that it is possible to reinforce them or withdraw their garrisons unseen. The positions should be commanded by the artillery and the infantry positions of the main line, so as to deny their use to the enemy after they have been vacated, and the works constructed on them should be of such a nature as to give no cover to the enemy. Intelligently made use of such advanced posts would fulfil a useful end.

It may occasionally happen that a point exists in front of the defensive line which would afford a very commanding position at short range for the enemy, and which therefore must be occupied and held at all costs. This case is different from that of an ordinary advanced

work which it is intended to vacate ultimately. Such a post must be made as strong and secure as possible, and the defenders must understand that they have to hold out to the last. If covered communication cannot be provided, reliefs and supplies, &c., must be carried out at night only.

The necessity for a second series of works behind the first has already been noticed. The object of the second line is, in the event of one of the positions in the main line having been captured, to oppose a bar to the further advance of the besiegers. Also these retired works will form pivots for the action of the general reserve in the event of any of the besiegers' troops penetrating the front line by any means.

The works should, if possible, be arranged so as to bring a heavy fire upon the rear of the works in the front line in the event of their being captured; also so that the attacker cannot make a dash between them upon the town or place defended. As regards the form of the works it will be quite unnecessary, after all that has been said previously, to enter on any argument to show that a continuous enceinte is totally unsuitable. Detached works or groups of works on the tactical points are infinitely better, and it will often be found that one powerful group of works on a commanding but retired position will successfully dominate a large section of the defensive area. For their general disposition and design the descriptions given in the case of the main works apply equally well, except that as a general rule they need not be so strong, and in many cases concealment will not be so necessary.

If the ground is favourable for defence, field works constructed after the outbreak of hostilities, or even after the siege has begun, might suffice for the second

line, but the positions of the gun emplacements should be carefully chosen, and as these for heavy guns take a long time to prepare, probably it would be best to construct the more important ones in advance.

The execution of field works during the course of the siege, for the purpose of increasing the strength of the defensive pivots and of providing additional gun emplacements and shelters for troops, will usually be a marked feature of defence operations. The advantage, too, of meeting the besieger's trenches and approaches by counter-approaches and advanced lodgments has already been referred to. But the multiplication of works in the intervals between the main fortified pivots is not generally to be encouraged, except in cases where there is some feature of special weakness in the intervals, or when a determined approach by trench work is being directed by the enemy against an interval. Such a spreading out of the line, and attempting to hold it everywhere in force, will inevitably result in weakness everywhere. The true tactical end to be borne in mind in such cases is the utmost development of fire from the pivots, which are presumably in situations which cannot be ignored or passed by, and neglect of the intervals, which are presumably more or less commanded or dominated from the pivots; or, briefly, concentration of strength on the tactical points.

What has been written in the preceding pages refers mainly to extensive fortified places or great fortresses with large garrisons; in small isolated positions held by detachments, though the general principles would be similar, the details of the practice would need some modifications. This, however, will be gone into in a later chapter.

CHAPTER XVI

ARTILLERY POSITIONS—DESIGN OF EMPLACEMENTS—CONCEALMENT—
BOMBPROOF COVER—MEANS OF ACCESS—OBSERVING STATIONS—
TELEPHONES—CHARTS—SEARCHLIGHTS — INTERIOR COMMUNI-
CATIONS OF THE FORTRESS—ROADS—RAILWAYS—LIGHT LINES
OF RAIL AND TRAM—TELEGRAPHIC AND TELEPHONIC COMMUNI-
CATION — OBSERVATORIES AND BALLOONS—COUNTER-MINING—
WATER SUPPLY—METHOD OF CALCULATING STRENGTH OF GAR-
RISONS

THE considerations which affect the selection of the sites for the gun and howitzer emplacements have already been discussed in Chapter XIV. The design of the emplacements will depend on the nature of the piece they are intended for. Broadly speaking, the conditions governing the case of the defence emplacements, in a position of the nature which has been described in the preceding chapters, are exactly similar to those which have always governed the design of the besieger's batteries in the past. Low commands and inconspicuousness are to be sought for, and the emplacements must be suitable for pieces on travelling mountings. That being the case, it would appear that the ordinary type adopted for siege batteries would be suitable for the fortress batteries; except that, in positions prepared in peace time, more lasting materials can be made use of.

In the latest issue, however, of the "Manual of Military Engineering," it is assumed that siege batteries will be in concealed positions, and will be attacked principally by howitzer fire. As no form of siege battery will give

protection against the impact and explosion of descending howitzer shells, it is proposed only to surround the gun platforms with splinter-proof walls to keep out fragments of shells which burst outside the emplacement.

A similar arrangement would do for the defender's howitzer batteries in retired positions, except that a passage must be left in the rear of the emplacement to enable the piece to be brought in and out. But if the battery is in so retired a position, or so well concealed by intervening high ground, woods, &c., that it cannot be seen from any part of the besieger's position, and observation of fire on it is impossible, then it hardly seems necessary to have even these splinter-proof walls, for a shell could only be dropped even into the neighbourhood of the emplacement by chance. If, on the other hand, the emplacement was anywhere visible, these walls would form too conspicuous a target. Against the fire of direct-firing guns, too, such walls would be objectionable, for they would catch shells that would otherwise pass by.

Emplacements for direct-fire guns, which would be in positions visible to the enemy, would have to endeavour to obtain concealment by being sunk into the ground, and by having a background of trees or rising ground in rear. The parapets must be most carefully made to match the surrounding ground, and shrubs or bushes, skilfully arranged, will often confuse the hostile observer's eye. The remarks on this subject in the preceding chapter with regard to infantry works apply equally here, and examination of the position from the enemy's point of view is also most necessary. Invisibility for such pieces is, in fact, a matter of supreme importance, provided, of course, that range and field of fire are not sacrificed. In hastily constructed defences it might be impossible to make the freshly thrown up earth match the surroundings; in such

cases it might even be better to give the guns no protection at all than to advertise their positions by newly turned parapets. As has already been stated in Chapter XIV., it will be better, for purposes of concealment, not to arrange the emplacements in a stiff row to form a battery. They should be at greater distances apart than the ordinary siege battery type gives, and grouped irregularly with each other. With proper arrangement and organisation, control need not be lost by this method.

In order to assist in obtaining concealment, the guns themselves should be painted to suit the surrounding ground. It is by no means certain that the regulation pattern khaki will always be the most suitable colour. With mobile guns it will be impossible to paint each one to suit its immediate surroundings, as can be done with fixed pieces; but the general tone of the country under various lights should be carefully studied. It is probable that no single colour will entirely hide a large gun, but that patches of different colours should be employed. Patches of the prevailing vegetation colour, on a ground of the prevailing soil colour, or *vice versa*, would probably be best. The under sides of large guns should be of a much lighter shade than the upper—perhaps even white; this gets rid of the shadow, and reflects the colour of the ground underneath. Judiciously done, the above methods will make an exposed gun entirely disappear from view. It may be noticed that this system is a copy of what natural development has done for wild animals, such as deer, fish, birds, &c., which have mottled or patched backs and white bellies, the reason for this development in their case being the same as in the case of our guns, namely, concealment from their enemies.

The actual design of the interior of the emplacements is a technical matter that need not be entered into here.

Owing to the solidity of the foundations and anchorage arrangements required for the heavier types of guns, it is most desirable that they should in all cases be prepared in peace time; but it is worthy of note that the Boers, before Ladysmith and elsewhere, constructed emplacements with concrete foundations and all, after the siege had been begun, and made use of them directly they were completed. For the lighter pieces the ordinary service double-decked platforms would be used, and they would be stored in the fortress ready for use when wanted.

The height of the crest of the parapet above the surrounding ground should be as little as possible, in order to keep the emplacement inconspicuous. This condition may sometimes clash with the necessity for command in order to get a field of view; the various considerations with regard to the selection of sites for emplacements, command, location forward or backward from the brow of the hill, means of communication, &c., have all been discussed in Chapter XIV., and need not be gone into again; many of them will always conflict with each other, so judgment must be exercised in weighing the advantages and disadvantages in each case.

Where the emplacements are liable to shrapnel fire, some form of cover for the detachments should be provided. This may, in the case of field defences, consist of two deep pits close against the front parapet, one on each side of the gun, similar in principle to those in the ordinary type of field-gun emplacement, but larger and deeper. Or overhead splinter-proof cover may be provided at the sides of the emplacements, or in the traverse, where such exists, between a pair of emplacements. Whatever it is, it should be so placed that the detachments can take post in it at a moment's notice on getting warning of a shell.

In defences built in peace time it is very desirable to give, in artillery positions exposed to view, bombproof cover for both the men and the guns. This cover, if for the detachments only, would best be close alongside the gun, as recommended for splinter-proof cover in the last paragraph; but if for the guns, these would best be in rear, and slightly to one side of the emplacements, so that the guns could be rapidly run back into them if an overwhelming fire were brought to bear. It must be remembered, however, that cover, to be proof against modern high explosive howitzer shell, has to be exceedingly thick and strong, so it is useless attempting to provide it except in defences built in peace time. Care should be taken that the cover should not afford a conspicuous mark, and thus disclose the position of the guns. With the heaviest types of guns and howitzers it might be that it would be impossible to remove them under cover quick enough to save them from disablement under fire; but, even for such pieces as these, the existence of bombproof cover in rear of emplacements would be most useful, as it would enable them to be kept close up to their positions, and secure till the phase of the operations in which they must be used at any cost. It is probable, however, that cover of this nature would only be provided at very important points, and where the guns were much exposed.

It is just as important with gun emplacements as with infantry parapets to avoid having anything in rear which would act as a stop-butt for shells, and the remarks on this head in Chapter XV. are equally applicable to artillery positions.

Expense magazines for at least two days' supply of cartridges are required in the neighbourhood of each battery or group of emplacements. They should gene-

rally be on the flank of the battery, conveniently close, and connected by a trench to give covered approach. All that is required is weather-proof, or possibly splinter-proof, protection, and, as cordite should not be stored in a temperature of over 100° Fahr., it would be necessary in hot countries to have a good earth covering, or possibly double roof and walls, to keep it cool. In addition to these expensive cartridge stores, shelters are also required for storage of high explosive shell, which would detonate if struck by a hostile shell. These shelters, in permanent defences, should be bombproof if possible; but where time, &c., does not admit of this, the shells should be dispersed in small quantities, each in a splinter-proof shelter, so as to minimise the damage and prevent dispersal of fragments if there was a hit. Other kinds of shell would be stored outside the battery, protected from the weather if possible. Recesses or benches for a few rounds of both shell and cartridge would be given in each emplacement.

Means of access to the emplacements, to enable the pieces to be brought in or taken out, is very necessary. If the communications are metalled roads, there should be a branch road, also metalled, right into the emplacement. But by far the best system for the transport of guns is a ceinture railway, with lines laid into the emplacements, and the guns mounted so as to fire from the trucks. In past years this has been considered an ideal arrangement, but impracticable owing to the difficulty in devising for heavy guns a suitable mounting for firing from trucks. But the stress of the war in South Africa has been the mother of invention in this as in many other military matters. There a railway mounting was constructed for a 6-inch gun, which permitted of it being fired from the truck at right angles

to the direction of the line of rail; and a 9.2-inch gun was similarly mounted, so that it could be fired from the truck in a direction more or less in prolongation of the line. It should be remembered that the gauge of the South African lines is only 3 feet 6 inches, and that the mountings were made up in the local railway workshops. The broader gauges used in other parts of the Empire would give greater stability, and it is evident that the design and construction in peace time of mountings of this nature is no longer impracticable.

Of course all communications, whether road or rail, into the emplacements, should be completely screened from the enemy's view.

In positions prepared deliberately it would be advantageous to provide in the close vicinity of the batteries some form of shelter, splinter-proof and concealed from view, for the night-manning details and reliefs of the gun detachments. If time did not admit of their construction, these parties would have to encamp or bivouac in the vicinity. Of course, where bombproof cover has been provided for the gun, no other would be necessary.

All the batteries would be given a distinguishing number or name, and the emplacements numbered in the usual manner from right to left. The names and numbers should be conspicuously painted on a board in rear. This is to ensure that guns, ammunition, supplies, &c., should always go to the places for which they are intended.

Every battery or group of emplacements requires two observing stations and one plotting station. The former should be on commanding ground—at all events, on points whence they can see all the objects to be aimed at. Very often, lofty buildings or trees would afford good

sites. They need not be near the battery if telephonic communication is provided. They should be as inconspicuous as possible, for it is reasonable to suppose that the enemy would fire at them if he could locate them. The plotting station would be near the battery, and it might be advantageous to make this the post of the battery commander. It would also be desirable to provide a post in a good situation for the Brigade Division commander, or commander of the Royal Artillery of the section. Details of these posts can be found in the authorised text-books. There should be telephone communication between all the above-named posts and stations; but if this has not been previously provided, and cannot be at short notice, recourse must be had to visual signalling, and this will limit the distance at which the observing stations may be from the guns. In permanent defences, telephones should never be omitted.

There may be many of the enemy's battery positions which cannot be seen from any of the sites available for observing stations. In such cases it may sometimes be possible to make use of captive balloons for observation. The use of balloons is, as is well known, attended by certain limitations, namely, they cannot be used in a high wind, and are liable to be hit; also "accurate" observation cannot, of course, be carried on from a balloon.

Accurate charts for all the Royal Artillery commanders are most essential. They should show, to a suitable scale, all the ground over which the battery can fire, and should be divided into numbered squares. They should show the arc of fire from each gun. In fact, they should be similar in general principles to those laid down in Garrison Artillery drill for coast defences, but with the features of the ground shown.

It would not, as a rule, be necessary to provide any works for the light quick-firing armament or for the field guns. The essence of the employment of pieces of this nature is surprise and mobility, so that there should be nothing that will mark the positions from which they will open fire. If any form of protection is required, field epaulments can be made when wanted. Bushes planted about the sites for such pieces will much assist in hiding them, and roads up to their probable positions will be necessary if the ground is bad.

Electric searchlights will play a very useful part in defence operations of the future. Not only will they be a protection against night attacks, but also, by their use, sapping or the execution of trench work by the enemy at night, at short and medium ranges, should be rendered impossible. They would be particularly useful in conjunction with light quick-firing guns or pom-poms, or with machine guns, as with such weapons a heavy fire could be immediately developed on the object illuminated by the beams. The position of the beam in relation to the guns should be well to one side, for the best position for seeing illuminated objects is for the observer or gun-layer to have his line of sight more or less at right angles to the beam. It would be much better if the lights were not in fixed emplacements, as this would tie them to one spot; moreover, the emplacements would be conspicuous, and would be seen by day and wrecked. They should, therefore, if possible, be on travelling mountings, so as to be used from any infantry parapet or from the open. It is well known that it is very difficult to hit a searchlight, owing to the impossibility of telling the range or observing the fire. The fact of its position constantly varying would also add to its security. The engine should be portable, if possible,

and placed behind cover; oil motors are more suitable for this work than steam, as the smoke from the latter often obscures the light. For land defences it is probable that a dispersed beam would be more useful than a concentrated one. In manipulating the beam, care should be taken that it does not light up any part of the defender's position.

The most important features of a fortress, or great defensive position, are the interior communications, and these should be the first of the works designed and put in hand when preparing a place for defence. If troops in a defensive position are subjected to attack by superior force before any works of fortification have been constructed, their position will be in no way hopeless, provided good communications exist between all parts of the defensive position, and ample facilities for bringing up reserves to any point. Earthworks can be thrown up with great rapidity under stress of circumstances, and most successful defences have been made where the above conditions existed, the case of Plevna being a notable example. If, however, the defending force is attacked in a situation where such communications do not exist, where the ground is broken and difficult and there are obstacles to the passage of men and guns, even the existence of defensive works will not avert defeat if the attackers have numerical superiority and are handled with resolution and tactical judgment, for it will be impossible for the defenders to apply the first principles of tactical action, namely, the application of force on the decisive points by bringing up reserves to threatened places.

Fortifications can be rapidly improvised, but roads in rocky hilly country or bridges over rivers and ravines cannot be made without skilled labour and a considerable

expenditure of time and materials. It is evident, therefore, that the latter are undoubtedly the most important and the first of the defensive measures which should be put in hand.

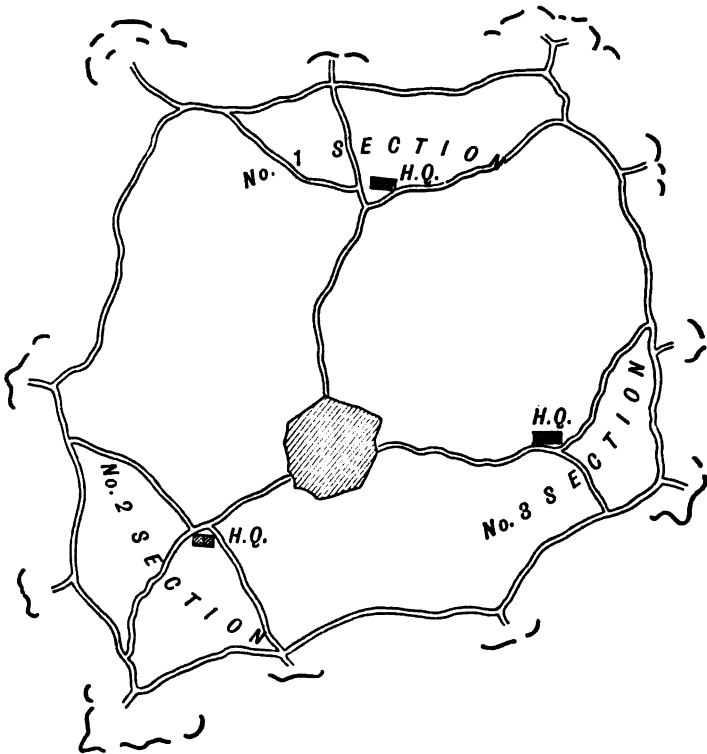
Very broken, difficult country is generally considered unsuitable for defence, partly on account of the amount of cover it affords to the enemy and partly on account of the difficulty of moving forces over it. But if good communicating roads, both radial and circumferential, have been provided within the defensive position, then, so far from being unsuitable, such a position becomes most advantageous, for freedom of movement is secured to the defenders but is still, from the nature of the country, denied to the besiegers. A position so prepared, even if devoid of works of fortification, is one of considerable strength. The communications in fact are, unless the country presents little or no obstacle whatever to movement in any direction, of far greater importance than the actual works.

In laying out the communications regard must be had to the probable tactical organisation of the defending forces. This has been explained at length in Chapter XIII. It is desirable to have a road or roads from the headquarters of each section to the different main defensive pivots in that section, also a road from the town or general headquarters—that is to say from the main supply and ordnance depots—to each sectional headquarters. In addition to these radial roads there must be a road all round the circumference of the position in rear of the works. A suitable typical arrangement is shown in the attached diagram, which is of course a purely imaginary case. To what extent such an arrangement can be achieved will depend largely upon the configuration of the country. There will

generally be existing radial roads out from a town, and these would be utilised as far as possible.

It is most necessary that the communications, particularly the circumferential ones, should be screened

ARRANGEMENT OF ROAD COMMUNICATIONS IN A FORTIFIED POSITION.

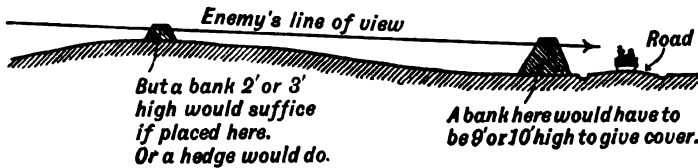


Plan.

from the enemy's view. This can often be achieved by laying them out behind rising ground, hills, or woods, and it will often be worth while to make the road a little longer in order to secure invisibility. But if no

other way is possible, then the road should be put in cutting or a bank thrown up on the side next the enemy as a screen. It will often be possible to do this with very little labour, as the bank need not necessarily be close alongside the road; if it were in the latter position it would have to be at least eight feet high to screen mounted men and guns, whereas sometimes a very small bank or a hedge on rising ground some distance off will give defilade from view.

In positions prepared deliberately in peace time much may be done to obtain concealment for the



Section. CONCEALMENT OF ROAD FROM VIEW.

communications and for the interior of the position generally by the judicious planting of trees, lines of hedge, &c. This should be done wherever possible, and the same means may often be employed to obtain a background for the works in the defensive line.

All roads of communication should be metalled throughout and fully bridged, so as not to be liable to any interruptions from the weather. They should also be of a good width so as to permit of trains of vehicles passing each other, and also to prevent blocks. Sign-posts should be provided at all junctions of roads, indicating the works and depots to which they lead.

The question of the transport of supplies, ammunition, &c., from the main depots in the town to the advanced

depots at the sectional headquarters, and from the latter to all the works, camps, &c., is one that will require the most careful organisation and the employment of a large number of animals and vehicles. It is evident that a great advantage would be obtained by the use of motor vehicles of some sort. Steam or oil traction-engines drawing a train of trucks will be in every way better than a long line of carts or waggons, but the particular advantage will be that the necessity for feeding a great number of animals will be avoided. Less attendants also will be required. The heavy guns could likewise be moved about by means of traction-engines of this sort.

When the circumstances will admit of railways being employed to supplement the road communications, great advantages will accrue. In great fortresses surrounding a town it may happen that the existing lines which pass through or radiate from the town can be utilised to a certain extent for the transport of stores. If possible they should be extended by branches to the sectional depots, or under specially favourable circumstances to close up to the main line of works. In any case there should be in all large fortified towns complete systems of sidings in the main ordnance and supply depots, in order that when supplies and stores are being hastily collected just before a siege there should be no blocking of the line by unloading trains.

A ceinture railway all round the main defensive line close in rear of the artillery positions would be an excellent thing, but whether it is practicable or not will depend on the configuration of the ground. Such an arrangement would admit of the artillery being rapidly moved from one part to another of the position. Delay would, however, still occur in loading and unloading the pieces into and from the trucks, unless they were mounted so as

to fire direct from the latter. It has already been shown that the last-named system may now be considered a practicable one, and the enormous tactical advantage that it would confer on the defenders renders its adoption in all first-class land fortresses prepared in peace time a matter of the first importance, except in cases where the ground absolutely forbids of it. Even without railway truck mountings it would be possible, if the ground suited, to have a ceinture railway with a branch line close up to the rear of each group of emplacements, and as the guns will be on travelling mountings, it will only be necessary to provide platforms of such a height that the guns could be rolled straight out on to them from the trucks. Winches and tackle to assist in hauling, or even cranes to lift the guns, could be provided so as to minimise the labour necessary. A railway of this sort should be screened from view in the same way as a road.

If circumstances do not admit of much use being made of the standard gauge railways, and it is considered undesirable to construct lines of this nature specially for defence purposes, then much might be done by the use of light railways on the 2 feet 6 inch or 2 feet gauge. A complete set of communications, both radial and circumferential, of this description would be of the highest value for the transport of stores, ammunition, and even troops and light guns.

In the absence of a line constructed in peace time, still lighter lines might be constructed when the fortress is being organised for war, if the necessary materials had been provided in advance and kept in store. Such lines would be for animal traction, horses, bullocks, or mules, according to what the resources of the country are. The gauge might be as small as 18 inches, and the lines could be extended into the advanced trenches, and thus

enable ammunition and stores to be taken wherever wanted. The use of trench tramways of this nature by the besieging forces is well recognised and provided for in our text-books. They would be equally useful to the defenders—in fact more so, as an animal of any kind can draw a many times greater load on rails than it can on a road, so the number of animals required for transport purposes would be very greatly reduced. In a besieged fortress, where the provision of food for animals is a matter of difficulty, this is a most important point. Such lines can be easily laid on existing roads. The provision of materials and waggons for lines of this nature should therefore be looked on as most necessary in all great fortified places.

Telegraphic and telephonic communication should be provided between all parts of the position, that is, from the fortress headquarters to each sectional headquarters, and thence to each important work or group of works in the front line, and also to the artillery commanders' posts. How much of this communication should be telegraphic and how much telephonic would be decided in each case according to circumstances; generally speaking the telegraph could be usefully employed from the centre to the headquarters of sections, and the telephone from the latter to the works, or it might be desirable to have telephonic communication throughout. The necessity for telephone communication between the Royal Artillery observing stations and batteries, and also between the positions of the supports and the firing line in the infantry positions, has already been mentioned; the principal infantry works and groups of works should also be connected with each other, as well as with the section headquarters.

The provision of means of communication with

the outside world is very important. Underground or subaqueous cables would effect this, but even if their situation were unknown to the besiegers there would still be considerable danger of their being found and severed. The introduction of Marconi's system of syntonic wireless telegraphy would, however, entirely solve this question, provided the distance from the fortress to the nearest post of the defender's friends were not greater than that over which the system can be worked. Every fortress should of course be provided with the Marconi apparatus.

Observatories for general intelligence purposes, in addition to and separate from the Royal Artillery observing stations, should be provided in suitable situations—natural eminences, lofty buildings, or trees being used where possible. Failing these, framed timber erections, as shown in the Manual, can be used, though they are necessarily conspicuous. A balloon is very useful for this sort of observation, and it is most desirable that every fortress likely to suffer attack should have a balloon unit available.

It is extremely probable that in a protracted siege mining would be resorted to by the besiegers if the defence was such as to preclude advance even by sap or trench work at short ranges, and if the soil was suitable. It behoves the defenders, therefore, to be prepared to reply with counter-mines and listening galleries, so all the requisite tools and stores (and men trained to their use) should be possessed by the fortress. The counter-mine galleries would usually break out from the trench or shelters behind some of the infantry parapets. In extremely important situations it might be desirable to have the counter-mine galleries prepared in peace time, or at all events undertaken immediately on the mobilisation

of the fortress for war. It is unnecessary to describe counter-mining operations, as the military text-books give full details.

The water supply of a fortress is a most important matter, and it will nearly always be necessary to provide for it by works in peace time. It is obviously necessary that the place should not be dependent for this essential requirement upon an outside source. If its supply is by means of a pipe or duct from a distance, it is extremely probable that the besiegers will find and sever it. It is most necessary, therefore, that for war time at all events it should be possible to obtain a sufficient supply both for the garrison and the civil population from sources within the defended area, that is to say, from wells. These must, of course, be sunk in peace time, and it is very desirable that the water thus obtained be pumped up into elevated tanks or reservoirs at such a height that it can be conveyed by pipes to every part of the defensive position. Care must of course be taken that the situation of the wells is such that there will be no danger of pollution from the numerous encampments that will spring up as soon as the war garrison of the fortress is mobilised. Such an ideal arrangement as the above will seldom be attainable, and in the event of the available supply during the siege becoming insufficient for the usual demand, it will be necessary to place the entire water supply under military control, appointing inspectors to prevent waste, closing all taps and stand pipes except at certain hours, and if necessary restricting the amount issued to each family in the civilian population and to each man of the garrison. A considerable economy can generally be effected by restricting the use of the pure water to drinking and cooking only, and there will usually be streams or rivers whence water for washing and

cleaning purposes, and for flushing drains, &c., can be obtained.

In the event of the only available supply during a siege being from a river, owing to the pipe supply being cut by the enemy, it will be necessary to take steps to sterilise the water by boiling or otherwise before it is issued to the troops for drinking. The river will presumably flow past or through the besieger's lines, and it would be unreasonable to expect him to be so solicitous for the health of the defenders as to take steps to prevent the river being polluted.

Having now described in detail the manner in which it is believed the principles of the defensive art may in the present day be best applied to the defence of a great area, and having enumerated the works which would be required, it becomes possible to show how the strength required for the garrison of such a position may be estimated.

The usual method recommended in books on Fortification and adopted in practice is to employ a very rough rule of thumb for the purpose, namely, to measure the perimeter all round, including intervals between works, and to allow so many men per yard run. Now, it is evident that in a position of the nature that has been described previously, such a method cannot have any approach to accuracy. It was no doubt good enough for the days of continuous enceintes when the actual parapet was practically continuous, and it was a mere question of getting as many men into the firing line as possible, but it is an obsolete and unscientific method now. It makes no allowance for the great or little distance apart the main works are, for the natural strength of the ground, and, more important than all, for the power of supporting and reinforcing threatened

points; that is to say, for the existence or absence of good communications. So evidently is this method inaccurate that no two authorities agree as to what is the right number of men per yard of front, and examples of past sieges give most strikingly divergent results if worked out in this manner. Just as defensive tactics and organisation have become in these later days more complex, so must more scientific methods be employed in calculating the garrisons.

The correct method is to begin with the infantry, taking each section of the defensive area separately. The garrison of the works can be calculated with fair accuracy by measuring the actual length of the lines of infantry parapet, and allowing a certain proportion of defenders per yard, with the addition of a percentage of supports. The question is what the proportion should be. The usual rule in the latter end of the nineteenth century has been that the actual defenders of a parapet, exclusive of supports, should be in the proportion of one man to about one and a half yards of parapet. But with the greatly increased power and rate of fire of modern firearms so great a proportion is no longer necessary. A military writer of the present day, writing from the actual theatre of war in South Africa, with the experiences of the campaign fresh in his memory,¹ has recorded his opinion that one man to every four paces is sufficient, and that in cases where the foreground is very open and the defender's cover particularly good, the proportion may safely be reduced to one man to every eight or ten paces of front, though in addition to these numbers he adds an immediate support of equal strength to replace casualties. The firing line and immediate supports combined he

¹ Major Callwell, R.A., "Tactics of To-day."

therefore estimates at one man for every two to five paces of front.

Such figures, however, do not afford the information which we require at the present stage. It is not practicable, nor would it be desirable, to lay down any rule as to the strength required for the firing line, as this must vary during the combat according to the tactical exigencies of the moment. It has already been pointed out in a previous chapter that if the communications in rear of a position are good, and covered situations for supports exist in the vicinity, the number of men kept in the advanced trenches should be as low as possible, and should not exceed the strength sufficient to develop a musketry fire which will preclude all advance by the enemy over the open within effective range. For the purpose of ascertaining what this strength should be the proportions above quoted form a useful guide. But for the entire garrison of a defensive position more than this is required. We have to bear in mind that it is necessary to provide for the defence of our positions during the later stages of the attack, when the besiegers, by the execution of trench and sap, or by gradually creeping from cover to cover, have approached to within assaulting distance of the works. At this stage we require to be able to man the works at the threatened positions with the greatest number of men that can effectively make use of their weapons, and this number we know to be approximately one man per yard of parapet occupied.

This, then, will give us a basis on which to calculate our garrisons, and we may take it that the strength of the infantry in each section of the defensive position—that is, of the firing line, supports, and section reserve combined—should be such as to give one man per yard

of all the trenches which can be subjected to simultaneous attack.

It is also necessary to provide for losses from the enemy's fire, which in the last stage will inevitably be heavy, and from disease during a possibly protracted siege, which will be greater still; it is probable that from 25 to 50 per cent. extra will not be too much to allow on this account. It has further to be borne in mind that it is desirable to provide some additional troops for the execution of local counter-attacks which would be carried out by the section reserve, also for manning additional field works which may be thrown up during the siege, and for the performance of camp duties, guards, out-posts, &c. It will therefore be necessary to calculate the strength at not less than two men per yard of trench.

It is not desirable to settle beforehand what proportions the firing line, supports, and section reserve should bear to each other, as this is a matter that can only be decided at the time of combat according to tactical circumstances; it has already been stated that it will depend largely on the strength and importance of the position, the distance between the advanced trenches and the positions of the supports and reserve, and the state of the communications. All that it is necessary for the designer or constructor of the defences to know is for approximately how many men he should provide cover at the positions of the supports, and for how many camping space, huts, water supply, &c., are required at the section reserve camps. For this he must exercise his judgment on the lines previously referred to, but he will generally be on the safe side in allowing for 25 per cent. of the infantry in the supports, and 50 per cent. in the section reserve.

It is important to so allocate the garrisons of the

advanced works and the strength of the supports that the normal tactical units are employed as far as possible, and that units of the same corps should support each other. Thus the length of each infantry parapet should, if possible, be such that it can be held by a distinct unit, such as a company, half-company, or section. All the advanced works in a given defensive pivot should be allotted to a given number of companies, and the supports to other companies of the same battalion.

When it is desired to roughly estimate the garrison required, in order to see if the line it is proposed to take up is too extensive for the force available, it will not be possible to calculate the garrisons of the main defensive pivots in so accurate a manner as described above, as the actual works will not at that stage have been designed in detail. But a practical soldier will be able to estimate without difficulty by inspection approximately what number will be required to hold any given position.

In the same way the strength of the infantry garrisons of the other sections of the defensive area is calculated. The strength of the artillery may be estimated at thirty men per medium and heavy gun (three reliefs of ten) and say eighteen men per light quick-firing gun. If available, some field artillery with the section reserves would often be useful. Of engineers it is impossible to have too many, but if possible they should be not less than one-twentieth of the strength of the infantry.

Having got in the above manner the fixed garrisons, there remains the general reserve or mobile force. The strength of this would depend mainly on the facilities that are likely to be obtained for active measures. It is desirable to have it equal in strength to the total of the fixed garrisons, and in any case if possible not below

half that strength. Mounted troops (armed with the long rifle) and field artillery would be usefully employed with this reserve if the defended area is a large one.

The strength arrived at for the garrison of a defensive position by the above method of calculation, which is based on the number of yards of parapet which can be attacked simultaneously, will almost invariably be a good deal less than that which would have been obtained by the old rule, based on the number of yards of the entire perimeter of the place. But the experience gained in South Africa shows that this is in accordance with recent tactical developments, and proof has many times been furnished that the number of men required to hold a defensive position in the present day is much less than of yore.

Though the above may seem a lengthy and complex method of arriving at the garrison required for a fortress or fortified position, yet in practice it will be found not to be a matter of any difficulty, and the estimate thus formed will be far more reliable than that obtained from the old rule of thumb method of calculating so many men per yard of the entire perimeter.

CHAPTER XVII

ORGANISATION OF THE DEFENCE OF A FORTRESS—PREPARATION IN ADVANCE OF A SCHEME—STRENGTH AND DISTRIBUTION OF GARRISON—ACCOMMODATION OF TROOPS AND STORES—ARTILLERY SERVICES—ENGINEER SERVICES—ORDNANCE DEPOTS—SUPPLY—TRANSPORT—MEDICAL ARRANGEMENTS—SANITATION—VETERINARY ARRANGEMENTS—CIVIL ADMINISTRATION—NECESSITY FOR A COMPLETE AND DETAILED SCHEME

It may be easily realised from the description given in the foregoing chapters of the shape that the defence of a great fortress or fortified position will take, that a most elaborate and carefully thought out organisation will be necessary to ensure that on the mobilisation of the fortress for war all the requisite works and measures will be carried out, the tools and stores required will be forthcoming, and the administrative services can be at once organised on a proper basis.

This can only be done by drawing out a complete scheme beforehand, foreseeing every want, and recording how it should be met. This Defence Scheme, as it is usually termed, should be prepared with the utmost care and attention to detail. It should contain, not only a detailed description of the organisation, but also a complete statement of all the measures that have to be taken, this statement being in every way self-explanatory, so that on mobilisation for war every individual concerned should be able to ascertain exactly what he has to do, and where he should procure the necessary means to do it. At the same time the

judgment of the commanders, as regards minor tactical questions or small administrative details, should not be fettered.

The preparation of a great fortress for war is an operation having a close analogy with that of the mobilisation of a field army. Peace establishments have to be expanded, in many cases new ones created, equipment and stores issued, supplies and ammunition collected and distributed, the troops brought together, distributed to their posts, and housed or encamped. Finally, the armaments have to be mounted and made ready, an immense amount of engineer work to be performed, and administrative services generally organised and set in motion. Without a well thought out organisation, confusion would reign supreme, and the work not be done.

It is proposed to give in this chapter a *résumé* of the information that should be contained in a Defence Scheme, and of the method in which it should be prepared.

Such a scheme would begin with a description of the strategical relation of the defended locality to the general theatre of war, of the reasons the enemy would have for desiring to obtain possession of it—in short, of the object of fortifying it.

It would then describe the direction and strength of the probable attacks, and the various methods in which they might be made.

Next the tactical aspects of the line actually selected for defence would be discussed, and the works, artillery positions, and communications enumerated and described, the attacker's positions would be described, and a general idea given of the tactical methods which it was proposed to employ in the defence. Any particular feature or

conditions which would have an important bearing on the defence would here be brought to light.

The above would form a sort of preface or introductory statement in terms sufficiently detailed to enable one to form a clear idea of the problem and of the modes of solving it. The remainder of the scheme, containing details of all the measures to be taken, would be divided into heads, somewhat on the following lines.

Strength and Distribution of the Garrison and Staff.—

In this section the strength of the garrison required for the defence of the fortress would be stated. The manner in which the defended area is divided into sections would be described, and the strength of the force for each section and for the General Reserve laid down. In each section the minimum obligatory garrison of every work, or group of works, including their supports, would be stated, and the numbers allotted to the Section Reserve put down. It should be remembered that all this allotting of troops to sections and to individual works or positions should be done in complete units, battalions, companies, half-companies, and sections, and the supports and the firing line should always be companies of the same battalion. If possible, the actual corps allotted to the fortress on mobilisation should be named, and should be allocated by name to the different sections. It will not be possible, however, to do this anywhere outside the United Kingdom. On account of the constant transfers of units in peace time, and of the fact that in the possible theatres of war the requirements of field armies would first have to be met, it is not possible with our organisation to tell in advance where the fortress garrisons will be drawn from.

The strength of the garrison artillery will be similarly stated, and its distribution to the various sections

of the defensive line described. The armament of the fortress will be enumerated and similarly distributed between the various sections according to their importance. The artillery will, however, always be liable to be moved from one section to another for purposes of concentration on the parts of the line where it is most required.

The Engineers will be similarly dealt with, and also the Departmental Corps. The General Reserve will consist of the most mobile troops, mounted infantry, if possible, and field guns.

There should be a tabular statement showing each unit, its allocation, and the method of housing it.

In this section of the scheme should also be a list of all the principal commanders and staff officers, namely, the fortress commander, the different section commanders, and the commander of the General Reserve, the commanders of the Royal Artillery and Royal Engineers, chief staff officer, chief intelligence officer, and all the other staff and departmental officers that would be necessary. It is very desirable that the actual officers nominated to these appointments should be named, so that they could prepare themselves in advance for the duties they would have to perform in war; but if this cannot be done, a list of the appointments which would have to be filled up should be made.

Arrangements for Housing the Troops and forming Depots for Stores, &c.—This is an important question, for if it is not worked out beforehand and definitely recorded, very great confusion will arise on mobilisation when the units forming the garrison arrive, and it is found, perhaps, that neither tents, huts, or billets are available for them. Similarly the positions of all depots for stores, supplies, &c., should be known in advance, so that as

the immense quantities of them arrive they may be at once distributed to the proper places.

It will seldom happen that barracks, or even billets, will be available for any but a small proportion of the war garrison of a fortress. Even if they existed, they would in most cases be situated in or close to the town itself, whereas the bulk of the defenders must be located close up to the line of defensive works, probably several miles out from the town. Barracks or billets in the town might perhaps be utilised for the General Reserve troops.

The term billets is hardly a correct one in this connection, for it is quite certain that it would be impossible to find in any place sufficient billets of the nature authorised in the Army Act, *i.e.* in victualing houses, for a considerable force, and, moreover, by that Act billeting is only authorised for troops on the march. Outside the United Kingdom the conditions are different, but the remarks that follow would, as a rule, apply equally. Of course, if an attack were imminent and a state of siege proclaimed, the fortress commander would be justified in doing many things that are unauthorised by law, or even directly contrary to it. He would in such a case not hesitate to quarter troops on the civil population, or to remove the inhabitants of houses and hand over the latter for use by the troops. But in many cases the mobilisation of our fortresses would take place, and their garrisons would arrive long before the enemy could appear before them, or before the military situation had become such as would warrant the adoption of such measures as the above. Meanwhile, the troops must be accommodated somewhere, and it must be under cover of some sort. Practically, it would come to the hiring of quarters, and

if sufficient payment were given, no doubt accommodation would be forthcoming with the owners' consent. Large public buildings, dry warehouses, &c., should be utilised, as far as possible, and suitable buildings should be taken up for hospitals. The steps to be taken, and the buildings proposed and their capacity, should all be recorded in the scheme.

For the troops forming the garrisons of the works, and for the section troops, encampments would be best, as they could be placed in the most suitable situations as regards vicinity to their duties. The provision of a sufficient number of tents would be among the services to be provided by the Ordnance Department. The sites of the various encampments should be chosen in advance, regard being had to sanitation and water supply, and their positions marked on a map of the defensive area.

If the climate be severe either from cold and damp or from heat, it might be necessary to provide huts for the troops. Their location would be fixed as in the case of camps, but the provision of them would be arranged for under the engineer services. It would generally still be necessary to have tents for the troops to occupy till the huts were built, as this would take some time. All huts and camps should be out of sight of the enemy.

Similarly the position of the various depots and stores should be fixed and recorded on plans. The depots referred to are the ordnance depots and magazines, artillery and engineer parks, supply depots, &c.; details of these depots would be found under the various heads of the scheme. Certain buildings might be required for storage of perishable stores, or for establishment of workshops, repairing shops, &c., and the arrangements for obtaining them should be recorded.

Organisation of Artillery Services.—The artillery would

have a lot to do on the organisation of the fortress for war. Probably the armament would have to be brought out of the places where it has been kept in peace time, or unloaded from the railway in which it is sent up from the rear, mounted, and taken out to its emplacements; observing instruments obtained from store and set up in the observing stations; charts of the enemy's position prepared; ranges measured; auxiliary marks for back laying set up. Ammunition would have to be drawn from magazines and distributed in the expense stores at the batteries. The arrangements for issue of ammunition, both artillery and small-arm, throughout the siege, would be in the hands of the artillery—that is to say, the main or central magazines would be under the Ordnance Department, and the advanced depots in each section under the Royal Artillery, who would also arrange for the issue to the various batteries and works.

There might be difficulties in the way of preparing a detailed scheme in advance of all the above services. For instance, it is, unfortunately, sometimes not even known in peace time what the armament would be, but at least a general statement of the various measures necessary should be prepared so that an idea could be obtained of what had to be done, and no chance would be left of anything important being forgotten. As regards the ammunition supply, it should be possible, and would be most desirable, to have a detailed tabular statement showing what advanced depots would be required, their situation (generally at the headquarters of sections), and the number of rounds of each description to be kept in each; also the amounts to be kept in the expense ammunition stores and in the small-arm ammunition recesses or stores in the infantry works. The

ammunition supply is a vitally important question and requires careful organisation.

Organisation and Execution of Engineer Services.—

The work to be carried out by the engineers will be of the most extensive and important character. It will entail the use of great numbers of tools and quantities of special stores and materials. It is essential, therefore, that there must be a fairly detailed statement in advance of all the work to be done, so that it may be ascertained what tools, stores, and materials are required, and arrangements made for procuring them. What amount of labour will be required for the various works should also be detailed; from what sources, military or civil, it is to be obtained; and how it is to be controlled and supervised. It will be best to divide the engineer work up into different heads, as some of the branches are of a specialised nature.

(a) *Preparation of Defence Works.*—There will always be a great deal to be done under this head. Even if the principal works and batteries have all been provided in peace time, there will be supplementary musketry trenches to be constructed, overhead cover to be provided, and perhaps works at weak points in the intervals; also the platforms for the guns and howitzers will have to be laid in the emplacements, additional emplacements constructed for the light armament, observing stations for Royal Artillery and observatories for intelligence purposes built, obstacles to be provided, a large amount of clearing to be done in the foreground, and possibly additional communication roads to be made. It may sometimes happen that few, or even none, of the defensive works have been provided in peace time, so that on the outbreak of war they have all to be constructed *ab initio*. It will, therefore, be necessary to have plans and sections of all the

works of every description which it is proposed to carry out immediately on mobilisation, with a detailed statement showing for each work, or group of works, what tools, stores, explosives, and special materials would be required, what would be the number of men required to carry it out, by what agency it is to be done, namely, whether by military working parties, by civil labour under Royal Engineer supervision, or by contract.

In preparing these plans and statements, it is very desirable not to fetter the judgment of those who are in command of the fortress at the time war supervenes. It is necessary that the general line of defence, and the position of the main defensive pivots, should be definitely laid down, and that the approximate situation of the various works which remain to be executed should be indicated, for it is undesirable that the large strategical and tactical questions which are involved in these points should be left to be decided hastily at the last moment by the local staff. But as regards the actual siting and exact design of the works to be carried out on mobilisation, a certain amount of discretion must be left to whoever is the commander at that time. Detailed plans will have to be made in order to arrive at an estimate of the tools, materials, and men required; these plans would at least form a very useful guide, but it should be understood that they might be departed from in details.

The statement of tools and materials required should be carefully worked out and a liberal margin allowed for contingencies, breakages, loss, &c. The statement should show where all the articles are to be obtained from. As far as possible all these articles should be obtained locally—that is to say, all such as cannot be purchased at short notice from firms in the towns itself should be

obtainable from the Ordnance Department, and these should, in all important fortresses, be kept in store in peace time. It should be remembered that the engineers' tools and materials will be required directly on the mobilisation of the fortress, and that the necessary works cannot be begun without them. The railways connecting the fortress with its base will at such a time be congested by the transport of troops, ordnance, and other stores, so the engineer stores should be locally obtainable or else kept in store.

The defence scheme should contain a list of the firms from whom the various kinds of stores could be obtained, showing approximately how much each of them could be relied on to supply at short notice from their stocks in hand.

The stores that will be required will be entrenching and cutting tools in large numbers, carpenters' tools and smiths' tools, &c., measuring tapes, rods, and tracing lines, large quantities of timber in scantlings and planks; nails, dogs, and spikes; wire, plain and barbed; cordage, spars, sandbags, sacks, canvas, twine, &c., &c.; also explosives for demolitions and for blasting in rock; possibly bridging stores and materials for huts.

Engineer parks should be established, advanced ones in each section for issue of tools and stores as required for works, and a great central one for reserves of everything. In connection with the latter, workshops (carpenters' and smiths') should be established for skilled work. In these probably civil labour would be employed under Royal Engineer supervision, as the few skilled men available belonging to the Royal Engineers would probably be wanted out at the works, &c. A good deal of the work in connection with the water supply, hutting, &c. (dealt with below), would be done in these workshops.

The defence scheme should give full details as to the situation and organisation of these stores and shops.

The defence scheme should also give complete details as to the agency by which all the engineer works will be carried out. For the execution of fortification works military labour would be largely employed, and this form of labour would be exclusively used for all works in the front line carried out under fire or in the enemy's presence. A certain number of Royal Engineer officers and non-commissioned officers will be required. For a large proportion of the unskilled work, particularly in the interior of the fortress, civil labour might be employed; this would be regularly enrolled for the purpose. Some kinds of work can be conveniently done by contract, as it relieves the always undermanned Royal Engineer staff from having to make the organisation for procuring the materials and men and of a good deal of the supervision. The defence scheme should contain a list of respectable reliable firms for such work.

(b) *Water Supply*.—It is seldom that the ideal arrangement would exist beforehand of a sufficient supply derived from sources inside the fortified area and laid on to all works and camping grounds in pipes. In the event of there being a probability of the enemy "getting at" the supply, it might be necessary to sink wells or bore for water inside the fortified area. The places where water is most likely to be found should be ascertained beforehand and marked on a plan; all stores and materials should be in store or locally procurable. Even if this had not to be done it would almost certainly be necessary to lay branch pipe lines to the camping grounds, depots, works, &c., to erect stand pipes, and to construct storage tanks and drinking troughs for horses and cattle.

The control of the water supply system, if in civil hands, should be taken over by the military, and turn-cocks and inspectors appointed to regulate the supply, prevent misuse and waste, report leaks, &c. If the supply became scanty careful measures would have to be taken to regulate the issue, taps would have to open only at certain hours, and the use of the water for any except absolutely necessary services be forbidden. It might even be necessary to put sentries on the stand pipes and taps, and to limit the quantity to be drawn by each person.

If pipes could not be laid into the vicinity of the works, some arrangements for the conveyance of the water would be necessary, such as water carts; this, however, would be a matter for the Army Service Corps to organise.

If the only available water supply be impure, or likely to be contaminated, the scheme should contain a statement of the measures to be taken to sterilise a sufficient quantity for drinking purposes.

The water supply in a siege is a most important matter, so a précis should be prepared of all the measures necessary of the kind enumerated above, and a statement of the agency by which they would be carried out, and of where the materials are to be obtained.

(c) *Hutting*.—In the event of hutting being necessary, a material for the huts such as is procurable locally should be chosen. The work could probably best be done by contract, divided among two or three good contractors. The defence scheme should contain a detailed statement showing the accommodation for which huts will be wanted at the various parts of the defensive line, and the number of huts required. It would be best

to have all the huts of one fixed size and type design, say to hold twenty-five or fifty men; this would enable all the parts and fittings to be made in large quantities, perhaps by machinery, and would facilitate erection. There should be lithographed copies of the type design kept with the scheme. A tabular list of all the parts and scantlings required might with advantage be en faced on the type drawings.

(d) *Telephonic and Telegraphic Communication.*—The scheme should contain a diagram showing the proposed arrangement for telegraphs and telephones respectively all over the fortress—that is to say, for the command and administrative lines and for the Royal Artillery lines between observing stations and batteries. The diagram should show which of the lines are to be aerial, underground, or submarine respectively. It should also indicate clearly and accurately which already exist and which have to be provided on mobilisation.

There should be a statement showing by what agency the telegraph and telephone communications, if not completed in peace time, are respectively to be provided. If it is to be by military agency a complete statement of the necessary stores and instruments should be attached. The statement should also show by what organisation the lines are to be worked and maintained in war. It is probable that in most cases the whole thing could best be done by the Government Telegraph Department. The provision of means of communication with the outside world should also be included in the defence scheme.

(e) *Railways.*—If these are to be employed in the interior communications of the fortress, the defence scheme should contain at least a précis of the measures necessary. There should be a plan of any extension

or branches proposed on the standard gauge lines, and of any extra sidings or unloading platforms that may be required. It is probable that all work in connection with the standard gauge lines could best be carried out by the permanent civil organisation of the railways. If narrow gauge lines or field tramways for animal traction are to be employed, there should be a plan showing the proposed location of them. The agency by which they are to be laid should be mentioned. If this is to be military, then there should be a detailed statement of all the tools, materials, plant, and rolling stock which will be necessary, and of where they are to be obtained from.

There is another important duty in connection with railways which must be carried out just before the fortress is attacked, and of which details should be given in the defence scheme. The portions of the permanent lines of rail which lie between the fortress and the enemy's country or direction of approach must be rendered useless to him, so as to prevent him using them to bring up his siege train, ammuniton, supplies, &c. All rolling stock from the hostile direction should be withdrawn into the fortress, and the line should be cut in such a way that its repair by the enemy is impracticable. This would be done by destroying some large and important bridge, or better still by blowing in a long tunnel.

(f) *Other Engineer Services.*—The above are the principal branches of the engineer work that would be necessary to put a fortress in a state of defence. There are, however, several other branches, the possibility of providing which will depend on whether the means exist. Balloons are most desirable for observation, but this requires the presence in the war garrison of

a Balloon Section Royal Engineers. Without this it will not be possible to organise balloons except in great cities with large resources. Exactly the same remark applies to Electric Searchlights. These are requirements of the first importance, and a regular Searchlight unit should be allotted in war to every fortress. It could be considerably augmented as to personnel from the civilian electricians of the town. Without such a unit it would be seldom possible to improvise searchlights, though if the special stores, such as projectors, lenses, &c., existed, it might be possible to improvise portable engines and dynamos worked by civilians. Motor vehicles for transport purposes are also most useful; large towns might be able to produce them. The defence scheme should deal with any organisation necessary in respect of the above services.

Sanitary works might also in some cases form part of the engineer services, and if so, should be mentioned in the defence scheme. The question of sanitation will be dealt with separately; it is only in the execution of the necessary works that it concerns the engineer directly.

It will be readily understood that works of so extensive and diverse a nature as those which have been enumerated in the preceding pages could not be properly executed unless careful organisation existed beforehand, and the question of how to obtain the necessary stores and tools had been carefully thought out and arranged for.

Ordnance Depots.—The position of the main Ordnance depot should be selected, preferably in a place where stores can be brought right into it by rail (or water transport, if that is employed). Main magazines will presumably exist in peace time; if not, they may have to be constructed by the Royal Engineers. The

advanced ammunition depots would presumably be in charge of the Royal Artillery, but advanced depots for all equipment and ordnance stores, probably at the headquarters of sections, would be necessary in a very large fortress. The sites should be shown in the defence scheme, so that stores can be sent out at once to their proper positions. Fitters' and wheelers' shops would also be required, and their establishment should be arranged for.

Complete lists of all ammunition, equipment, and stores, including tools for engineer services, which are required for a siege, should be prepared beforehand, and a statement made showing how such as are not kept in store in peace time are to be obtained on mobilisation. In this due regard should be paid to the fact that during war time the arsenals or depots whence supplies are usually drawn would be overwhelmed with work, and the railways would be congested. If it is intended to purchase any of the stores there should be lists of the firms who can supply them.

The arrangements for issues and the augmentation of the staff must also be thought out.

Supply Arrangements. — Exactly similar arrangements are required for supply depots, namely, a great main central depot and advanced depots (if the fortress is a large one) at the headquarters of sections. These sites should be selected and recorded. Every possible want in the way of food, fuel, forage, &c., for a siege, the duration of which must be liberally allowed for, should be foreseen, and the arrangements by which they can be provided for recorded. It should be remembered that it will probably be necessary to feed not only the garrison and followers but also a considerable portion, if not the whole, of the civil population.

Transport Arrangements.—The arrangements for the transport of ammunition, supplies, stores and equipment of all kinds from the main magazine and store depots to the advanced depots and thence to the batteries and infantry positions, would require an organisation of considerable magnitude. In this also would be included the provision of means of moving the heavy guns and howitzers from one part to another of the defensive line. The provision of an immense number of draught animals and vehicles would be necessary. The steps to be taken to provide these, to appoint a staff of officers and non-commissioned officers to organise and control them, and to form transport depots at convenient points, should all be recorded in the defence scheme.

Other forms of transport might also be employed where circumstances admitted. If waterways exist, barges and lighters would be taken up, and steam tugs or other means of towing them provided. Motor vehicles would be most useful, though their provision and management would probably be best undertaken by the Royal Engineers; and the same remark applies to railways, though the working of tramways with animal traction would naturally fall to the transport department. The fullest possible use should be made of mechanical means of traction, so as to reduce as far as possible the number of animals that would otherwise have to be kept and fed during the siege.

Medical Arrangements.—These should be completely worked out and recorded in the defence scheme. The best building in the town should be noted to be taken up as the main hospital, or some of the existing military or civil hospitals could be so used. Advanced field hospitals would be necessary (in extensive fortresses) in each section. Arrangements for the transport of wounded

should also be organised. The scheme should also show where all medical appliances are to be obtained from. The employment of civilian doctors of the town would be provided for. Hospitals, separate from those of the military, would be required for treatment of civilians; probably one of the existing civil hospitals would be suitable for these.

Sanitary Arrangements.— In every besieged place this is a most important matter. It may, in some cases, be necessary to make provision for the disposal of all the sewage. For instance, if the sewage is water-borne, it might happen that through the enemy cutting the water supply it would become impossible to find water for sewage disposal. Or if the sewer outfall were outside the defensive line it is conceivable that the enemy would block it up. In any case it would be necessary to dispose of the sewage of the troops in the encampments and in the works and batteries. It would be dangerous in the event of a long siege to permit of the use of the ordinary trench latrines close to the encampments. Removal of excreta and the burial in localities far removed from habitations or encampments, and in places where it could not pollute the water supply, would be necessary. Or incineration might be resorted to. Similarly, arrangements would be necessary for the disposal of all garbage and refuse, for the removal and destruction of all corpses of animals. All these and many other sanitary measures require to be organised; they are of the utmost importance, for, if they are neglected, virulent outbreaks of enteric fever are certain to ensue, and perhaps cholera also.

The best way to ensure proper attention to sanitation by all parties during the course of the siege would be to form a Sanitary Inspecting Board, the members of

whom would devise and organise the various measures considered necessary, and by personal inspection would see that they were carried out, and the sanitary regulations obeyed by all concerned. Such a board might be partially medical officers and partly influential civilians.

Its organisation might, with advantage, be defined in the defence scheme, and a précis given of the principal measures.

Veterinary Arrangements.—Hospitals and a proper organisation for the veterinary treatment of the horses of the mounted troops, and of all transport animals, would be necessary, and particularly arrangements for segregating and treating outbreaks of infectious disease among them. The sites of segregation lines must be carefully chosen. The defence scheme should contain a statement of the measures necessary under this head.

Civil Administration, Law, Police, &c.—On the occurrence of a state of siege the supreme civil power will be vested in the fortress commander. The duties and measures which this entails are of a most important and onerous nature. It is only possible here to refer briefly to a few of the more important ones. As a general rule it would be best to allow the actual details of the administration to be carried on by the existing civil authorities, subject to orders by the fortress commander; this arrangement would reduce to the minimum friction in carrying out the measures considered necessary. In such a case the mayor or head of the municipality or town council might advantageously be made a member of the fortress commander's staff or council, so that close touch might be maintained between the military and civil authorities.

It may be easily conceived, however, that in cases

where the town council were an inefficient body, or where the population were aliens, or were partially disloyal, it might become necessary to suspend the town council, and replace them by a military commandant with a suitable staff, by whom the government and control of the civil population would be carried on.

An important and necessary step prior to the siege is the deportation of all undesirable persons, such as those known to the police as members of the criminal classes, agitators, loafers, persons known to be disloyal, &c. Also as many as possible of the useless mouths should be induced to quit, free passage being given, and, if necessary, provision made for them elsewhere; women, children, sick persons, the very aged, the destitute, should by this means be got away.

Of all the able-bodied male inhabitants, a large number could be profitably employed. The police force would require considerable augmentation, and could be recruited from this source; a town guard could be enrolled and armed, for the protection of the town itself, for providing guards for magazines, supply depots, &c., and for quelling disorders; others could be formed into volunteer corps of infantry, which, after some drill and instruction, could be allowed to take their places in the fighting line. Others could be formed into bearer companies, or enrolled as transport drivers, labourers on the engineer works, &c., while the sanitary services would utilise a large number as scavengers, &c. Most of the artisans and of the tradespeople, such as butchers, bakers, &c., could be profitably employed at their own trade for military purposes; and the services of the professional classes and of the more influential men would be freely availed of in supervision of many of the administrative services.

To try all cases not amenable to military law, it will often be desirable in a besieged town to appoint a standing Court of Summary Jurisdiction, consisting of civil magistrates and military officers, and it will often be desirable to put the civil police under military officers, and possibly to form a secret police to guard against sedition and rebellion.

Measures will be necessary to feed the civil population by the establishment of kitchens, and by putting all on rations. All the provision dealers' stocks would usually be taken over.

The supply of cash for payment of troops, civilian workers, &c., should be arranged for.

The above is only a short sketch of the principal measures that would have to be taken as regards the civil administration of a besieged town. It is impossible here to describe them in detail. Their multifarious and important nature,¹ particularly in cases where the population is alien or hostile, would require a special staff of officers and good organisation.

It would be difficult to give in the defence scheme full details of the organisation necessary under this head, as so much would depend on the circumstances of the moment, and particularly on political conditions, but a précis of the more obvious measures, such as those relating to the employment of civilians, to the organisation of police, and enrolment of town guards, might be given, and a statement prepared showing the staff that would be necessary to deal with the question.

The principal points to be attended to in the organisation of a modern fortress for war have now been enumerated and briefly described. The list, however, is by no means exhaustive, as numbers of other questions

¹ *Vide* Baden-Powell's Report on Mafeking in Appendix.

will commend themselves to any one who undertakes in detail the preparation of such a scheme. It is quite evident that success will depend to a large degree upon the extent to which the organisation has been thought out and perfected in peace time. The possibility of thus having a perfected organisation, and well-matured and rehearsed plans, is one of the great advantages which the defending side has over that of the besiegers, who are operating at a distance from their bases, on unfamiliar ground, and under unknown conditions. Without a well-prepared scheme of defence, not only will this advantage be forfeited, but also great difficulties will arise.

Notwithstanding this, there are some who hold that the preparation in detail in peace time of a paper scheme of defence is useless, even mischievous; mischievous in that to lay down minute details for others to conform to would fetter and cramp the judgment of those who command when war breaks out; useless in that in actual practice the commanders would ignore the instructions, and act as seemed to them best. Such persons argue that it is unnecessary to waste time and cover reams of paper with detailed descriptions of matters which would be settled without difficulty by practical men when the necessity arose,¹ and that all that is needed is a statement of the general principles upon which the organisation should be based.

It is almost impossible, however, to believe that such arguments can be sound. Over-preparation in advance has never yet done any harm, while the want of it has often been the cause of great disasters. It is a fallacy to suppose that "practical men" will always intuitively do the right thing at the right time, and it is

¹ The writer has more than once heard these identical arguments put forward by military officers, and therefore thinks it worth while to combat them.

unreasonable to expect that in the confusion and excitement attendant on preparation for a siege every one will remember and carry out all the measures that are necessary, unless they have been recorded in advance by other persons who have patiently studied the question in peace time, unhurried and unexcited, aided by references to books and authorities, and supported by statistics and data. As in all other matters, success can only be ensured by patient study, good foresight, and unremitting industry. It is better to spend many hours in writing down details deliberately in peace time, even if many of them turn out to be unnecessary, than to run the risk of a single essential requirement being overlooked in war.

It is not difficult to foresee the chaos that would result if no prevision had been exercised. Large numbers of troops would be arriving, while no place existed for their accommodation, the weather being perhaps too inclement to permit of bivouacs in the open. Immense quantities of stores would be coming by rail, only to be left lying about in confusion, or even to be left in the trucks without unloading, and thus to congest and block the railway lines. The defence works could not be executed for want of tools and materials, the ammunition could not be taken out to the works for want of transport. No one would know what he had to do, how to set about it, or whence to procure the means of doing it. When the investment was completed, it would be found that many essentials had been overlooked and were wanting.

There is no reason why any one's judgment should be fettered by a detailed scheme. Detail should only be entered into as regards technical matters, and questions involving provision of materials, stores, supplies, &c., and not as regards tactical and administrative questions.

They should be aids to organisation and not rules absolute. For instance, in regard to the engineer works it is necessary to go into details to a certain extent in order to estimate the number of tools and materials necessary, and the strength of the working parties, and also to give an idea of the general requirements in regard to additional works, and to ensure that none are overlooked, but it would be idle to define in detail the section or design of the proposed works, or their exact sites. The commander would decide for himself whether they should be on the brow of the hill or down the slope; whether they should have a command of 2 feet or of 5 feet; whether they should be 3 feet deep or 4 feet 6 inches. The same principle would be exercised in regard to the other services.

Every defence scheme requires constant revision to ensure that it is kept up to date, and that all changes in organisation, armament, &c., are embodied in it. Tactical conditions also are constantly changing, and the changes have the most marked effect on questions of defence. For instance, the increasing power of arms may necessitate a change in the situation of the entire line of defence and in the designs of the works.

For these reasons at least every three years the scheme should be carefully scrutinised and brought up to date.

CHAPTER XVIII

DEFENCE OF SMALL ISOLATED POSTS OCCUPIED BY DETACHMENTS—
DIFFERENCE IN PRACTICE WHEN THE FOE IS UNCIVILISED, OR
HAS NO ARTILLERY—RECAPITULATION OF THE LEADING PRIN-
CIPLES TO BE OBSERVED IN ALL CASES—DIFFICULTY IN
AVOIDING FALSE PREMISES—DANGERS OF GENERALISING FROM
SPECIAL CASES—IMPORTANCE OF CORRECT APPRECIATION OF
CONDITIONS IN EVERY CASE—CHANGEABILITY OF PRACTICE
BUT IMMUTABILITY OF PRINCIPLES—CONCLUSION

THE foregoing chapters have dealt only with the case of an extensive fortified position, held by a very large force, and liable to attack by an army, conditions, in fact, which would only be met with at points of very great strategical importance. At places where only a small force would be available for the defence certain modifications would be necessary. In such a case so extended a line could not be taken up, so it would be impossible to have the defensive line so far out as to keep the enemy beyond bombarding range of the town, and the pivots would probably be closer together. Also it would probably not be necessary to divide the fortified area up into sections. The general principles and methods of defence would, however, be similar to those already described, subject to such modifications as the altered conditions would require.

The case would be different when the position was quite a small one to be held by a small isolated detachment, as might exist for the defence of a bridge, or of a post on a line of communications, on which an attack

in great force or very prolonged siege was not anticipated. In such a case a widely extended position made up of fortified pivots at intervals would be impossible. The smallness of the defending force would necessitate its remaining more or less concentrated. A defensive post of this nature would in past times have taken the form of a single enclosed fort or redoubt; but, as has already been pointed out when discussing the form of works for the defence of the main pivots of a line, it is very doubtful whether the usual redoubt form would be suitable under the conditions of the present day.

Greater dispersion of the defenders is permissible when the latter are armed with magazine rifles, and is very desirable in order to minimise loss from hostile artillery fire. A redoubt or fort would therefore have to be considerably more extensive than formerly, and it would be difficult, if not impossible, to design one on ordinary ground which would not form a conspicuous mark or even act as a shell trap. There is no need to recapitulate the arguments in regard to this question, as they are set forth fully in Chapter XII. It is believed that the methods advocated for the defence of the tactical pivots of a great defensive position would also be the most suitable for a small detached position, that is to say, that instead of providing a continuous redoubt or fort, it would be better to construct simple trenches or parapets, in such a manner as to interfere as little as possible with the natural appearance of the ground, in fact to rely on skilful treatment of the natural features of the position selected.

The points to be aimed at in designing the trenches and gun emplacements of such a position would be the same as those given in Chapters XV. and XVI. for the pivots of the defensive line, namely, the utmost develop-

ment of fire on to the enemy's positions and lines of attack, concealment, cover for the defenders close behind or under the parapets, and for the reserves in some central place, covered communication between the different parts of the position and between the firing line and positions of the reserves.

An isolated position of this nature would have to be prepared for all-round attack, so some of the trenches and emplacements would be required to face to the rear, and care would have to be taken to avoid the possibility of these receiving fire in reverse. Shelters for the reserves would be necessary in some central part of the position, and this should be bombproof if possible, and in any case well concealed. Shelters for storage of supplies, ammunition, &c. would also be required, and the important question of water supply must not be overlooked.

The position selected for defence would not in such a case necessarily contain within itself the object to be defended. It would hardly ever be possible to find a position that could be made defensible by a small force immediately round the object, if the latter were a bridge, railway station, or place of that nature; it would usually be sufficient if the position commanded the object and the approaches to it at short ranges. Sometimes it might be necessary to make the defences in the form of two positions supporting each other, and both commanding the object.

It is evident that the great power of artillery in the present day must make it far more difficult to provide effective cover, by means of works improvised at short notice in an isolated position subject to all-round attack, than would be the case in a position which forms one of a chain, and which can only be attacked from the

front. In the latter case concealment from view and cover from frontal fire can often be obtained for the supports and reserves behind the reverse slopes of hills or in hollows; also ridges or hills will mask the defender's movements, and when laying out trenches one has only to guard against fire from one direction. But in an isolated position, spots that would be concealed from the front will often be visible from the rear, and it will sometimes be very difficult to guard against enfilading fire. We can hardly hope to find a tract of ground which will naturally give the concealment and cover which is so necessary, that is to say, which will be in the form of a circular ridge or chain of hills surrounding and hiding a central open space. Far more engineer work therefore is required to make an isolated position defensible against all-round attack. When such a position can be prepared by permanent works constructed in peace time, this state of affairs would not matter so much, for a considerable amount of bombproof cover, or of underground shelters, the positions of which would be totally concealed, could be provided.

Similarly in connection with artillery positions great difficulties will be found in an isolated restricted position. The methods advocated in Chapter XIV. as regards the tactical employment of the defence artillery, namely, mobility, concentration on important points, withdrawal from dangerous situations, &c., will be impossible in a position of this nature from want of space. Something might be done in this direction by providing alternative emplacements for the guns, by giving bombproof cover in which they could be run if the hostile fire was overwhelming, by taking steps to ensure that the emplacements could not be taken in rear and by concealment of their positions; but it is difficult to see how in a restricted

position the guns could avoid being overwhelmed if they were attacked by a greatly superior force of artillery.

The value of mobility being greatly discounted by the necessarily restricted nature of the site in a small defensible post, there might conceivably be places of this sort, the importance of which was so great as to warrant the provision of one or two guns in steel tourelles or cupolas, or behind armour of some sort.

There is yet another class of fortified post the design of which would differ greatly from the methods previously described. The British forces are often opposed to enemies who are unprovided with artillery, such as uncivilised races of various sorts, and it is often necessary to establish fortified posts, generally for small forces, in their country. It sometimes happens that these enemies are well supplied with modern rifles, and are adepts at using them, as, for instance, were the Afridis in the campaign of 1897-98, and the Boers in the later stages of the South African war, but the problem of defence is even then modified and much simplified by the absence of artillery.

It is evidently unnecessary in such cases to employ the elaborate methods which would be necessary against civilised enemies. Protection against rifle bullets is easily obtained, and neither concealment nor overhead cover are in such cases necessary. The conditions revert in a great degree to those which prevailed in Europe a century ago, except that the immense density of fire and long range of the modern rifle enables a handful of men to inflict destruction on great numbers. The form of the defences may somewhat resemble those of mediæval times, masonry blockhouses afford as good a form as any other, and villages or any strong buildings also make valuable defensible positions.

In designing works of this nature regard must be had to the character of the enemy. Many savage races are far more difficult to stop in an attack than European troops; they have, moreover, a special aptitude for creeping up under cover of natural features of the ground, or by night; their attacks sometimes take place at unexpected times or under treacherous circumstances, and are generally characterised by extreme determination; in fact, the prospects of their succeeding in getting to close quarters are greater than is the case with a civilised enemy. For a fortified post in a savage country, therefore, a material obstacle is generally essential; so if the work itself does not provide one in the form of a wall or stockade, a strong independent one in the shape of barbed wire entanglements or abattis should be provided. A clear field of fire is, of course, imperative, and flank defence should be provided, dead angles being inadmissible. A neglect of this precaution led to the fall of the fort at Saraghari, on the Samana range, in the North-West Frontier campaign of 1897.

Every fort of this nature should be self-contained, that is, should contain room for storage of supplies and ammunition, and should be possessed of its own water supply. A simple and suitable form of trace is that largely adopted on the north-western frontier of India and in Upper Burma for military posts. It consists of a square enclosure with two towers or blockhouses at the opposite diagonal corners. Inside the main square are the huts or barracks for the garrison and the stores, &c. The square corner towers give flank defence to the sides, and have machicolated roof battlements for the defence of their own sides.

The materials of which such forts would be built would depend on the resources of the country. There is

no need to go into details, and these would vary greatly in different parts of the world according to circumstances and local resources.¹ Machine guns form most valuable adjuncts to defences of this nature, and light quick-firing guns or pom-poms would have a most useful effect. Even old small-bore guns, fitted with breech-loading mechanism and firing case, are very effective against rushes.

In the earlier chapters of this work it was stated that there are certain prime conditions which every defensive position or work should fulfil, and these are: firstly, that it should admit of the utmost possible scope for the effective use of the weapons employed by the defenders; secondly, that conversely it should restrict to as great an extent as possible the effect of the attackers' weapons; and thirdly, that it should permit of freedom in tactical handling of the defending forces.

It is believed that these principles are of universal application, and that if correctly followed they will correctly solve the problem of defence under all conditions, whether against civilised armies provided with the latest inventions in ordnance, or against savages armed with matchlocks and spears. But certain premises have to be made, and much depends upon their correctness.

The first postulate, as regards scope of the defenders' weapons, admits of no argument, and its application is obvious. A clear field of fire, and as many rifles and guns as possible brought to bear on the attackers as long as they are within range, are all that is necessary to fulfil it.

The second is the one where false premises may

¹ An article entitled, "Fortification in Savage Warfare," by Major W. D. Conner, R.E., in the Professional Papers of the Corps of Royal Engineers for 1895, gives an interesting and instructive description of the methods adopted in many of our wars against uncivilised races. The latest issue of "Instruction in Military Engineering" also deals fully with this subject.

lead us astray. We have first to realise who will be the probable attackers; what will be their character and mode of tactics; with what weapons they will be armed; and (most difficult of all) what the effect of those weapons will be.

These are questions to which, from the very nature of the military art, it is seldom possible to ensure a correct answer. We can only judge of modes of tactics and of the effect of weapons by the actual experience of war, but campaigns on a large enough scale to afford reliable illustrations on these points are of rare occurrence. Even then we may be led into false conclusions. A given campaign may bring into a strong light certain tactical conditions, and we are apt after it to base all our teachings on the lessons thus brought prominently to notice, ignoring altered conditions and other valuable lessons which escape observation by not having been prominently brought to light. Also tactical conditions change with great rapidity.

Thus during the past thirty years, that is, throughout the period of service of the present generation of officers, all our tactical teaching has been strongly coloured by the events of the Franco-German war. This has been particularly the case as regards the relations between the attack and the defence, and as the great power of well-handled and well-directed artillery in breaking down the resistance of troops on the defensive. We have been taught to consider that the attack possesses great inherent advantages over the defence, and that the steady ordered frontal advance of well-trained and disciplined men, assisted by the well-aimed fire of powerful field artillery, would be able in the present day, as it was on the German side in 1870, to overcome any defence that could be offered.

Again, every new invention in ordnance adds to the uncertainty as regards tactical problems. Weapons of immensely increased power are introduced. The only way of judging of their effect is by means of peace experiments, and, under the conditions under which these are carried out, the tendency always is to over-estimate their effect: this has undeniably been the case of late years as regards ordnance.

We therefore entered on our last great war under the impression that tactical methods based on German teaching, combined with a powerful field artillery, would overcome the defence of a foe who, though individually hardy and resolute, had little discipline or training.

Our enemy, however, though he knew nothing of the Franco-German war, was shrewd and self-reliant. He argued that if he could make himself unseen it was probable that even the most powerful gun would be unable to hit him, and that if, while unseen himself, he could find a cranny to fire his rifle through, he would be able by the rapid fire of that weapon, in the use of which he was an adept, to stay the advance of the well-disciplined, but unpractised at cover-taking, British troops. His premises were more correct than were ours.

We found that the effect of our high explosive shell and other powerful artillery inventions was not so great as we had expected, that troops and guns in well-concealed positions will suffer little loss, even without the protection of overhead cover, armour, &c., that the effect of the modern magazine rifle was greater even than had been anticipated, and that the abolition of smoke had an enormous effect on tactics generally and in particular had conferred immensely increased strength on the defensive side. All this we had to learn from painful experience by reason of the incorrectness of our premises, which were

based on the experience of a campaign thirty years old, and on the peace achievements of our new weapons.

Unfortunately, we have no guarantee that the same thing will not occur again. We may fall into the same mistake of arguing from a single campaign instead of from an intelligent reading of all past history, of basing all our teaching on the events of the Boer war, and of ignoring the different conditions of other theatres of war, as well as the changes which are very rapidly brought about by the march of time. There is a danger of the swing of the pendulum taking us to the other extreme and leading us to a belief in the invincibility of the defence, to a disposition to exaggerate the power of the rifle. It is possible that we may forget that it was the peculiar characteristics of the Boer which gave rise to his particular methods of warfare, that his want of initiative, reluctance to attack in the open or to come to close quarters, together with the defective handling of his artillery, were in a large measure the causes of the successful defences made by scanty British garrisons in the various sieges undergone by our side, and that from a well-trained and equipped European foe we must expect more enterprising methods. Further, new inventions in material are bound also to take place in time, and we shall be equally uncertain as to their effect.

It is evident that a correct appreciation of the conditions that prevail at the time and place, and of the effect of the weapons in use by the attackers, is essential to a proper estimate of the means necessary to fulfil the second of the three leading principles under discussion, namely, that of restricting the effect of the attacker's weapons. Even at the same period of time the conditions in different countries or against different enemies will vary widely. The forms that have proved suitable in

South Africa might not be so in Europe, where the thicker atmosphere would prevent fire at extreme ranges, where the different nature of the country would give more natural cover, but would impede movements, and might perhaps render concealment of new works impossible. Also the different character of European troops and of their leaders must be taken into account. Again, earthworks of light profile and well concealed would be suitable against civilised troops but not against fanatical savages, who may attack by surprise or treachery, and whose extraordinary impetuosity requires to be stopped by material obstacles in order to prevent the use by them of their weapons, *i.e.* spears or swords.

The third condition of those named above, namely, tactical freedom, *i.e.* mobility, is one that has been prominently brought to notice by the events of the late war. Every increase in the range and power of weapons increases the defender's advantages in this respect, for it forces the attackers to keep at greater distances, and allows of time for concentration and reinforcement on the inner lines of the defence. The importance of facilitating this by good and well-concealed communications is paramount in all cases.

It has been stated above that, in order to arrive at a proper estimate of the means necessary to fulfil for any given position which has to be fortified the broad principles enumerated above, it is necessary to form a correct appreciation of the conditions which prevail at the time and in the country where the place is situated. The difficulty of doing this, particularly in regard to the second principle, has already been pointed out. How then can this difficulty be overcome and the danger of making a false estimate guarded against or minimised?

It would seem that the principal point to be attended

to is to remember that no form of works or methods of defence are suitable under all conditions; that what will suit in South Africa will not suit on the frontiers of India, nor in Europe; that the methods and forms that were used in the last European war are unsuitable to-day, and that it is reasonable to suppose that those of to-day will have to be discarded in ten years' time. Instead, therefore, of pinning our faith to particular forms which have been successful at certain times and places, we should commit to memory the great universal broad principles and, when it is necessary to devise at any time a mode of defence, we should endeavour by the use of our judgment and observation to apply these principles to the special conditions which then exist at the place.

This is a hard matter; it is easy to learn rules or the dimensions of the particular forms of works, still easier to copy types from a book, but to form a correct judgment upon new and strange conditions is another thing. Yet it is the only way to ensure success. The power to achieve this can only be acquired by a diligent study, not alone of the special circumstances of the latest campaign, but of all past military history. A careful analysis of the siege operations of the past will show in what manner the broad principles which govern the defensive art were applied by those great commanders whose names have given lustre to the annals of their countries, under the varying conditions which prevailed at different times. History contains innumerable examples from which most illuminating lessons can be derived; every case illustrates either by success or failure some particular principle, and a knowledge of these principles and a systematic tracing of their action under the widely different conditions that have prevailed from the days of arquebuses and petronels to those of breech-loaders and smokeless powder, will

afford a training to the mind of the student which will enable him to apply those same principles with confidence under new and strange circumstances.

It is to this end that an endeavour has been made in these pages to trace the working of these broad principles through some of the chief siege operations of the last century or so, including the events of the recent war in South Africa. The examples given have had of necessity to be dealt with in a somewhat short and superficial manner. An entire book might, in fact, be written in analysis of each of the campaigns here dealt with, and there are many more which would afford valuable lessons which have not been touched on.

The forms and methods of defence recommended as suitable for the present day are, of course, only intended as suggestions illustrative of the mode of applying the same broad principles to existing conditions. They are put forward with no authority, and only deserve consideration and acceptance to such extent as the reasonings and deductions on which they are based commend themselves to the judgment of the reader.

APPENDIX

A P P E N D I X

MAJOR-GENERAL BADEN-POWELL'S REPORT ON THE SIEGE OF MAFEKING

Extract from "The London Gazette," dated 8th February 1901

No. 13.

*From FIELD-MARSHAL LORD ROBERTS to the SECRETARY
OF STATE FOR WAR.*

ARMY HEADQUARTERS, SOUTH AFRICA,
PRETORIA, 21st June 1900.

MY LORD,—I have the honour to submit for your Lordship's consideration a despatch, dated 18th May 1900, with annexures and a letter dated 6th June 1900, from Major-General R. S. S. Baden-Powell, describing the siege of Mafeking, which lasted from the 13th October 1899 to the 17th May 1900, and bringing to notice the officers and men, as well as the civilians and ladies, who rendered good service during the above period.

2. I feel assured that Her Majesty's Government will agree with me in thinking that the utmost credit is due to Major-General Baden-Powell for his promptness in raising two regiments of Mounted Infantry in Rhodesia, and for the resolution, judgment, and resource which he displayed throughout the long and trying investment of Mafeking by the Boer forces. The distinction which Major-General Baden-Powell has earned must be shared by his gallant soldiers. No episode in the present war seems more praiseworthy than the prolonged defence of this town by a British garrison, consisting almost entirely of Her Majesty's Colonial forces, inferior in numbers and greatly inferior in artillery to the enemy, cut off from communication with Cape Colony, and

with the hope of relief repeatedly deferred until the supplies of food were nearly exhausted.

3. Inspired by their Commander's example, the defenders of Mafeking maintained a never-failing confidence and cheerfulness, which conduced most materially to the successful issue; they made light of the hardships to which they were exposed, and they withstood the enemy's attacks with an audacity which so disheartened their opponents that, except on one occasion, namely, on 12th May, no serious attempt was made to capture the place by assault. This attempt was repulsed in a manner which showed that the determination and fighting qualities of the garrison remained unimpaired to the last.

4. In recording my high appreciation of the conduct of all ranks during this memorable siege, I desire cordially to support Major-General Baden-Powell's recommendations on behalf of those serving under his orders, and the civilians and others who co-operated with him in the maintenance of order, and in the care of the sick and wounded.—I have, &c.,

ROBERTS, FIELD-MARSHAL,
Commander-in-Chief, South Africa.

*From MAJOR-GENERAL BADEN-POWELL, Commanding at Mafeking,
to the CHIEF STAFF OFFICER TO LORD ROBERTS.*

MAFEKING, 18th May 1900.

MY LORD,—I have the honour to forward herewith my report on the siege of Mafeking by the Boers, from 13th October 1899 to 17th May 1900, for the information of his Excellency the Field-Marshal Commanding in South Africa.—I have, &c.

R. S. S. BADEN-POWELL,
Major-General.

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I.—RÉSUMÉ OF REPORT ON THE SIEGE OF MAFEKING.

I arrived in the beginning of August in Rhodesia, with orders—

1. To raise two regiments of Mounted Infantry.
2. In the event of war, to organise the defence of the Rhodesia and Bechuanaland frontiers.
3. As far as possible, to keep forces of the enemy occupied in this direction away from their own main forces.

I had the two regiments raised, equipped, supplied, and ready for service by the end of September.

As war became imminent, I saw that my force would be too weak to effect much if scattered along the whole border (500 miles), unless it were reinforced with some men and good guns. I reported this, but as none were available I decided to concentrate my two columns at Tuli and Mafeking respectively, as being the desirable points to hold.

Of the two, Mafeking seemed the more important for many reasons, strategical and political—

1. Because it is the outpost for Kimberley and Cape Colony.
2. Also, equally, for the Protectorate and Rhodesia.
3. It threatens the weak flank of the Transvaal.
4. It is the head-centre of the large native districts of the north-west, with their 200,000 inhabitants.
5. It contains important railway stocks and shops.
6. Also large food and forage supplies.

Therefore I left the northern column in charge of Colonel Plumer, and went myself to Mafeking, and organised its defence.

MAFEKING.

Mafeking is an open town, 1000 yards square, in open undulating country, on the north bank of the Molopo stream. Eight miles from the Transvaal border. White population about 1000.

The native Stadt lies half a mile south-west, and contains 6000 inhabitants.

DEFENCE FORCE.

Seven hundred whites, of whom 20 were Imperial Army, remainder Protectorate Regiment, British South Africa Police,

Cape Police, and Bechuanaland Rifles (Volunteers). These were used to man the forts and outworks.

Three hundred able-bodied townsmen enrolled as town guard. Employed to garrison the town itself.

Three hundred natives enrolled as cattle guards, watchmen, police, &c.

Half the defenders were armed with Lee-Metfords, half with Martini-Henry rifles, with 600 rounds per rifle.

TOTAL NUMBERS.

White men, 1074; white women, 229; white children, 405; natives, 7500.

Our armament consisted of—

Four 7-pounder muzzle-loading guns, one 1-pounder Hotchkiss, one 2-inch Nordenfelt—all old. Seven .303 Maxims.

To this armament we afterwards added—

One 6-pounder muzzle-loading old ship's gun, one 16-pounder muzzle-loading howitzer (made in our own shops).

I had two armoured engines promised from Kimberley. I had armoured trucks made at Bulawayo and Mafeking. One engine arrived, the other was cut off en route by the enemy and captured at Kraaipan.

THE SIEGE.

On the 13th October the siege began.

General Cronje with an army of 8000 Boers and 10 guns, most of them of modern pattern and power, surrounded the place.

On the approach of the enemy we sallied out and, in a sharp little engagement, dealt them a severe blow, by which they lost 53 killed and many more wounded, and which had a lasting moral effect.

During the first phase of the siege, October and November, General Cronje made various attempts to take the place. These attacks we beat off without difficulty in every case, and responded by sorties, varying their nature every time as far as possible, and making them so sudden and so quickly withdrawn as not to give the enemy's supports time to come up and overpower us. Of these "kicks" we delivered half-a-dozen, on 14th, 17th, 20th, 25th, 27th.

31st October, and 7th November (the Boers quote 14, but they include demonstrations and shelling of dummy forts, guns, and armoured trucks, &c., which we put up to draw their fire).

The enemy's losses in this period were very heavy as compared with ours—

Boers' losses—287 killed; 800 wounded.¹

Our losses—35 killed, 101 wounded, 27 missing.

Cronje having lost a month of valuable time at Mafeking, now gave up the idea of taking the place by storm, and moved off south for Kimberley with 4000 men and 6 guns (leaving General Snyman with the remainder, viz. 3000 to 4000 men and 6 guns, including a 94-pounder siege gun) to invest us.

Seeing then that we could not be relieved for many weeks, if not months, I took over into our own management all details, such as hospital, municipality, police, treasury, post and telegraph, railway, native affairs, water supply, ordnance shops, &c.

I also took over all food, forage, liquor stores, and native supplies, &c., and put everybody on rations.

I had disposed my garrison over what some of my officers considered a rather extended perimeter (about five or six miles), but everything was arranged for drawing in our horns if necessary. However, in the event we were able to maintain our original position, and even further to extend it as became necessary.

The next phase lasted three months, November to January, during which Snyman pushed his works and trenches nearer to the place.

He also drew a cordon of natives around the whole.

His artillery kept up a continual bombardment on the town.

On our part, during January, February, and March, we pushed out counter-works, and gradually gained point after point of ground till we obtained grazing for our live stock, and finally (after a hard tussle in the "Brickfields," in trenching and counter-trenching up to within seventy yards of the enemy's works), we drove them back at all points out of range for rifle fire of the town.

During this period, owing to the careful and systematic sharp-shooting of our men, the enemy's losses continued to be largely in

¹ These numbers are quoted from Transvaal newspapers, but must, I think, be exaggerated. I think that about 600 killed and wounded would be nearer the mark.

excess of ours. Forty per month killed was admitted by the Boer medical officer.

In April the enemy withdrew the siege gun, and contented themselves with investing us at a distance, and shelling our cattle in the hope of starving us into submission.

On the 12th May the enemy made a bold night attack on the place, and succeeded in getting into the Stadt with their storming party, but we beat back their supports and surrounded the remainder, inflicting on them a loss of 70 killed and wounded, and 108 prisoners, including Eloff their commandant (grandson of President Kruger).

In the meantime, Colonel Plumer had near Tuli prevented a force of Boers from invading Matabeleland from the south. After their retreat the rising of the river made the border comparatively safe, and I called him down to defend the railway and the Protectorate border (which were already being held by a small force organised from Bulawayo by Colonel Nicholson).

Colonel Plumer accordingly pushed down the line, repairing it to within forty miles of Mafeking, and pushing back the enemy who had been holding it. He then established himself in a good position thirty-five miles north-west of us, where he was in touch by means of runners and pigeons, was able to afford refuge to our natives escaping out, and he was also able to put a stop to enemy's depredations and to give security to the natives throughout the Protectorate, his force being too small to effect more till reinforced. His presence enabled us to get rid of nearly 2000 native women and children, which materially relieved the strain on our food supply.

Early in May he was reinforced by Canadian Artillery and Queensland Infantry, &c., and on 15th he joined hands with a relief column from the south under Colonel Mahon.

And, on the 17th May, the relief of Mafeking was successfully effected by the combined columns, after a siege of 218 days.

One of the most noticeable features of the long and trying siege has been the loyalty, patience, and good feeling which have prevailed throughout the community, civil, military, and native. The steadiness and gallantry of the troops in action, and their cheerful acceptance of hardships, are beyond praise.

The ladies, and especially those who acted as nurses in the hospitals, displayed the greatest patience and fortitude.

RÉSUMÉ OF POINTS GAINED BY THE RHODESIAN
FRONTIER FORCE.

(October 1899 to May 1900.)

I. AT MAFEKING.

1. A force of 8000 Boers and 10 guns was contained at the first outbreak of war, and prevented from either combining with the Tuli column, and invading Rhodesia, or joining the forces against Kimberley. Cronje's commando was thus held here for a month.

2. From 2000 to 3000 Boers and 8 guns (including a 94-pounder) were kept employed here for over six months.

3. The enemy expended considerably over 100 tons of ammunition, and lost over 1000 men killed and wounded, and had four guns disabled and one captured.

4. Large stores of food and forage, and general stocks, were prevented from falling into the enemy's hands.

5. Valuable railway plant, including eighteen locomotives, rolling stock, shops, coal, &c., were saved.

6. Refuge was given to a large number of British from the Transvaal.

7. Most of the local neighbouring tribes, and all those of the Protectorate and South Matabeleland, remained loyal, which they could not have continued to do had Mafeking fallen and they been at the mercy of the Boers.

8. Loss of prestige to Cronje's force, who had apparently expected to take possession at once on first arrival, and had had proclamation printed annexing the district to the South African Republic.

9. Eloff and 108 Boers and foreigners made prisoners of war.

2. THE RHODESIAN COLUMN.

During the same period the northern portion of my force under Colonel Plumer (in spite of its small numbers and the exceptionally difficult country and trying climate in which it was operating) succeeded—

1. In holding and sending back the enemy in their attempt to invade Rhodesia, *via* Tuli.

2. In holding the Bulawayo railway for some 200 miles south of the Rhodesian border.

3. In giving direct support and protection to the natives in Khama's and Liichwe's domains, and Bathoen's and the Protectorate generally when threatened by the enemy.

4. In pushing down and repairing the railway in the face of the enemy to within forty miles of Mafeking, and there establishing a place of security for our natives escaping from Mafeking, and collecting supplies ready to effect our relief of Mafeking on arrival of reinforcements.

3. THE PALAPYE COLUMN.

A small column organised by Colonel Nicholson, from Bulawayo, with armoured trains, &c., held Mangwe, Palapye, Mochudi, &c., on the railway until Plumer's column was available for the duty.

The whole of the frontier force, north and south columns combined, numbered 1700, while the Boers during the early part of the campaign had between 9000 and 10,000 out on their northern and north-western border. Country operated over, between Mafeking and Tuli, 450 miles in length.

II—MINOR POINTS CONNECTED WITH THE SIEGE.

(Alphabetically arranged.)

Ammunition	Food supply
Artillery	Fuel
Casualties	Garrison
Civil administration	Hospital
Communications	Natives
Compensation	Railway
Correspondents	Relief Committee
Defence accounts	Specialities
Defence works	Spies
Enemy's artillery—fighting,	Staff
treachery, field work	Transport
Finance	Women's laager

ARTILLERY.

Our so-called artillery should of course have been entirely out-classed by the modern high-velocity guns of the enemy, but in

practice they managed to hold their own in spite of their using powder, shells, and fuses all made in our own shops.

The artillery and also the ordnance shops were under Major Panzera, assisted by Lieutenant Daniell, British South Africa Police.

CASUALTIES.

I.—*Combatants.*

Whites—

Officers.—6 killed and died of wounds; 15 wounded; 1 missing; total 22.

Non-commissioned officers and men.—61 killed and died of wounds; 103 wounded; 26 missing; 16 died; 5 accidents; total 211.

Total—

Whites.—67 killed and died of wounds; 118 wounded; 27 missing; 16 died; 5 accidents; total 233.

Coloured.—25 killed and died of wounds; 68 wounded; total 83.

Total combatants, 316.

II.—*Non-combatants.*

Whites.—4 killed and died of wounds; 5 wounded; 32 died; total 41.

Natives.—65 killed and died of wounds; 117 wounded; total 182.

Baralongs.—264 killed and died of wounds; total 264.

Total non-combatants, 487.

Total all casualties during siege, 803.

Out of 44 officers, 21 were killed, wounded, or missing.

Out of 975 men, 190 were killed, wounded, or missing.

COMMUNICATIONS.

Local.

Telephone.—All outlying forts and lookout posts were connected up with headquarters, under management of Mr. Howat, postmaster, and his staff. I was thus able to receive reports and issue orders for all parts of the defence instantaneously.

Postal.—To cover the heavy expenses of runners, and for the convenience of the public, postage was established at 1d. for town, 3d. for outlying forts, 1s. for up country.

Signalling.—Heliograph, lamp, and flag signalling was established for defence purposes by brigade signallers, under Major Panzera and Sergeant-Major Moffat.

Megaphones were also made and used in outlying trenches and posts.

Phonophores were also used on the armoured train, attached to ordinary telegraph lines.

Distant.

Runners.—Native runners were employed twice weekly, or when necessary, to take despatches, letters, &c., to our northern column. They had to be highly paid, as the risk of capture and death was very great.

I was thus practically in touch with my force on the railway, and through them with Colonel Nicholson at the base, and Colonel Plumer's column at Tuli.

CIVIL ADMINISTRATION.

I established for the trial of all cases not directly amenable to military law, a Court of Summary Jurisdiction—

Members.

Resident Commissioner.

Resident Magistrate.

Town Commandant.

Officer Commanding Protectorate Regiment.

Chief Staff Officer.

At first it was a little difficult to make the civilians appreciate the restrictions of martial law, and, as times grew more critical, there came a tendency to spread rumours and to grumble: this had to be stopped.

I also published some explanatory remarks and advice on the working of martial law, &c., and these steps had a most marked effect: obedience to orders and a good spirit thenceforward prevailed in the garrison.

COMPENSATION.

From the commencement of the siege careful record was kept of all shell-fire damage to property, and claims of owners considered and assessed. Total assessed, £16,462, 10s. 2d. No promise was held out that Government would grant compensation, the proceedings were merely intended to assist the commission

should one afterwards be assembled, and to protect Government against exorbitant claims.

A record was also made of losses suffered by refugees in property, live stock, &c.

All live stock killed or wounded by shell-fire was bought at a fair price and utilised for food, so that the owners have no claims on this head; at the same time the value of the animals is in many cases not represented by cash, and it would be far more satisfactory to the owners if they could be repaid in kind. This is a point which I venture to suggest to be taken into consideration when dealing with the Boers after the war; a substantial fine in cattle would touch them heavily without leaving them destitute, and the bestowal of such cattle on deserving and looted loyalists would give great satisfaction and be far more acceptable to them, and less expensive to Government, than grants of money.

CORRESPONDENTS.

(Under Lieutenant the Hon. A. Hanbury-Tracy as Press Censor.)

These gentlemen gave a certain amount of trouble at first, as for the most part they were more reporters than correspondents. Further reforms in the matter of correspondents in the field are very desirable. The enemy derived a great deal of information as to our circumstances from the newspapers, and not only the local ones, but also from the Colonial and English papers, in spite of a strict censorship on our part.

DEFENCE ACCOUNTS.

(Under Captain Greener, British South Africa Police.)

Expenditure during the siege.

To labour, £13,024.
To pay, local corps and trench allowance, £20,777.
To pay, clerical and civil staff, £3543.
To foodstuffs, grain, rations, &c., £36,076.
To material, clothing, equipment, &c., £10,801.
To hospital staff, comforts, &c., £5411.
To local transport, £890.
Total, £90,522.
To payments other than defence, viz. frontier force, special pay, &c., £32,729.
Total, £123,251.

Receipts.

By foodstuffs and grain sales, £5184.
 By soup kitchens, £3242.
 By sales of Government property, £442.
 By local post-office, £238.
 By dog tax, £67.
 By fines, £127.
 Total, £9300.
 Weekly average expenditure in pay, £1550.
 Average receipts for rations, £625.
 Soup, £600.
 Total, £1225.

DEFENCE WORKS.

(Under direction of Major Vyvyan, for town and East Front ;
 Major Godley, West Front.)

Scheme.—General scheme at first was to secure the town and Stadt by clearing front, laying mines, fortifying outskirts, &c.

Then to push out advanced trenches to drive back those of the enemy, and finally to establish a girdle of outlying forts.

The scheme included the provision of bombproofs and extensive covered ways, gun emplacements, drainage, &c.

In all some sixty works were made, and about six and a half miles of trenches.

The perimeter of the works at first was approximately seven miles, latterly it extended to a little over ten miles.

Nature.—Generally semicircular redans, but no two works were similar in trace ; they varied according to position, ground, &c. At first dug out and kept very low, latterly, owing to difficulties of drainage, long grass, inaccuracy of enemy's shell fire, &c., they were made more upstanding. Head cover was found to be essential. When trenches were near, steel loopholes had to be used, the ordinary sandbag and wooden ones being too good a target to the enemy.

Huts.—A good form of portable iron and wood hut was devised, and used for housing the garrisons of the forts.

ENEMY'S ARTILLERY—FIGHTING, TREACHERY, FIELD WORKS.

Artillery Guns employed.

One 94-pounder Creusot, 15-centimetre, 20-lb. charge.
Two 7-pounders (Jameson's).
Two 5-pounders (Armstrong's), breech-loading.
One 9-pounder Krupp, breech-loading.
Two quick-firing 14-pounders, high velocity.
Two 1-pounder Maxims.
Total, 10 guns.

The 94-pounder fired 1497 rounds, and the artillery altogether fired 2000 rounds during the siege.

The damage done was very small, partly owing to the open nature of the town and lowness of our forts, but more especially on account of the want of intelligent directing of the fire.

Fighting.—The enemy's attacks invariably failed from want of discipline and pluck on the part of the men.

In the attack on Cannon Kopje they got within 400 yards, and even started digging shelter trenches, but when the men began to fall the rest retreated promptly.

The night attack on the Stadt, on 12th May, was boldly led by Eloff and a number of foreigners, and had their supports come on with equal pluck, we should have had a hard task to drive them out, but as it was the supports were easily beaten off and the storming party surrounded.

Treachery.—The enemy fired on numerous occasions on our hospital, convent, and women's laager, although these were conspicuously marked with Red Cross flags, stood in isolated positions, and had been fully pointed out by me to the Boer Generals.

The women's laager was deliberately shelled in particular on 24th and 30th October, 27th January, and 11th April.

The Red Cross flag was used to cover artillery taking up position on 24th, 30th, and 31st October.

Convent deliberately shelled, 16th October, 3rd and 8th November.

Our white flag, returning from a conference with the enemy, was deliberately volleyed, 17th January.

Field works.—The enemy's trenches were of a very good design, and made in well-selected positions. The typical trench or fort consisted of a chain of small chambers 10 feet square

partly excavated, partly built up with sandbags, having stout walls, loopholed to front and rear, the whole roofed in with corrugated iron and railway rails. Command, about 3 feet.

FINANCE.

(Under Captain Greener, as Chief Paymaster.)

I ordered all Government accounts to be kept settled up to date, so as to leave as little as possible for subsequent settlement; much work and confusion has thereby been saved.

The accounts were well kept by Captain Greener and his staff. An examiner of accounts was appointed to check accounts before payment, and also an auditor for the larger amounts.

Cash in bank amounted to £12,000, of which only £650 was in silver. Cash soon became scarce, because the public, especially the natives and Indian traders, concealed all the cash they could get, in anticipation of the place being taken by the enemy.

Paper money thus became necessary, and I issued coupons for 1s., 2s., and 3s. Ultimately gold also became scarce, and £1 notes were printed in cyanotype and issued; but they never got into real circulation, as people kept them as curios to the extent of £700. Ten shilling coupons were issued with satisfactory result.

For the convenience of the men, and to get cash from the public, a "Garrison Savings' Bank" was opened. Deposits amounted to £8800.

Total Government expenditure to end of May, £142,660.

Total Government receipts to end of May, £11,828.

FOOD SUPPLY.

(Under Captain Ryan.)

Early in the siege, I took over all merchant stocks and put everybody on rations.

Beginning on the usual scale, I gradually reduced it to the lowest that would allow of the men being fit for duty. During the latter part of the siege no extras of any kind were obtainable. All lived strictly on the following scale:—

Meat, at first, 1 lb. ; latterly, $\frac{3}{4}$ to 1 lb.

Bread, at first, 1 lb. ; latterly, 5 oz.

Vegetables, at first, 1 lb. ; latterly, 6 oz.

Coffee, at first, $\frac{1}{2}$ oz. ; latterly $\frac{1}{3}$ oz.

Salt, at first, $\frac{1}{2}$ oz. ; latterly, $\frac{1}{2}$ oz.

Sugar, at first, 2 oz.

Tea, at first, $\frac{1}{2}$ oz.

Sowens, latterly, 1 quart.

We had a large stock of meat, both live and tinned.

For live stock, we had to open up wide extent of grazing ground. We ate the fresh meat first in order to avoid loss from enemy's fire, failure of grass and water, lung sickness, &c.

The tinned meat we stored in bombproof chambers, and kept as reserve.

During the last two months we were on horseflesh three days a week.

Our stocks of meal were comparatively small, but we had a large supply of forage oats. These we ground into flour, and fermented the residue into sowens (a form of porridge), and the remaining husks went as forage to the horses.

Fresh vegetables were largely grown within the defences, and for a greater part of the siege formed a regular portion of the ration.

The cost of feeding the troops was 1s. 3d. per ration, or with fresh vegetables, 1s. 6d. ; about 3d. below the contract price in peace. Civilians paid 2s., and women in the laager 1s. 2d.

All liquor was taken over and issued in "tots" to the troops on wet nights, and I think saved much sickness.

Natives.—For the natives, we established four soup kitchens at which horse stew was sold daily, and five sower kitchens. Natives were all registered, to prevent fraud, and bought rations at one quart per adult, and one pint per child, at 3d. per pint.

Defence watchmen, workmen, police, &c., and certified destitute persons were given free rations. The kitchens so managed paid their own expenses.

They were under Captain Wilson, A.D.C., with Mr. Myers as cash taker and inspector.

FUEL.

Coal.—300 tons available at railway store, was used for armoured train, ordnance foundry, pumping stations, flour mills, forage factory, forges, &c.

Wood.—25,000 lbs. weekly for bakery, soup, and oat-sower kitchens, cooking, &c. Procured from roofs of huts in the Stadt, old waggons, lopped trees, fencing, &c.

Petroleum.—Asbestos stove made, but was not a success.

Patent fuel.—Cow dung and coal dust, mixed in equal parts and baked, produced 20 tons good fuel.

HOSPITAL.

(Victoria Hospital—70 beds. Base Hospital.)

Major Anderson, Royal Army Medical Corps, Principal Medical Officer; (Dr. W. Hayes acted as Principal Medical Officer during first part of the siege;) Surgeon-Major Holmden, British South Africa Police; Dr. T. Hayes, District Surgeon; Dr. Elmes.

GARRISON.

Protectorate Regiment. — Lieutenant-Colonel Hore, Commander.—21 officers, 448 men; British South Africa Police.—Lieutenant-Colonel Walford, Commander.—10 officers, 81 men; Cape Police, Division I.—Inspector Marsh, Commander.—2 officers, 45 men; Cape Police, Division II.—Inspector Browne, Commander.—2 officers, 54 men; Bechuanaland Rifles.—Captain Cowan, Commander.—4 officers, 77 men; deduct missing at Lobatsi, 1 officer, 26 men; total drilled men, 38 officers, 679 men; Town Guard, 296 men (untrained); total garrison, 44 officers, 975 men.

From the above Town Guard was formed the Railway Division, 2 officers, 20 men, under (local) Captain More.

The following commanded sections of the defence :—

Western defences, Major Godley; Stadt and south-western forts, Captain Marsh; Cannon Kopje and south front, Colonel Walford; South-eastern works (brickfields), Inspector Marsh, at first, Inspector Browne, latterly; North-east works, Captain Cowan; Town, Colonel Vyvyan, at first, Major Goold-Adams latterly.

Headquarters Staff :—

Chief Staff Officer—Lord E. Cecil; Deputy-Assistant Adjutant-General (B)—Captain Ryan; Intelligence Officer—Lieutenant Hon. Hanbury-Tracy; Aide-de-Camp—Captain Wilson; Commanding Royal Artillery—Major Panzera; Commanding Royal Engineers—Colonel Vyvyan.

HOSPITAL.

(Under Major Anderson, Royal Army Medical Corps, as Principal Medical Officer.)

Staff—Dr. W. Hayes (acted as Principal Medical Officer during

the first part of the siege); Surgeon-Major Holmden, British South Africa Police; Dr. T. Hayes, District Surgeon; Dr. Elmes.

Victoria Hospital (base hospital).—Nursing Staff: Miss Hill (matron) and three nurses, assisted by four volunteer nurses; also by Mother Teresa and six sisters; Convalescent Hospital.—At convent, Lady Sarah Wilson; Women and Children's Hospital, Miss Craufurd.

On outbreak of war I took over the town hospital, but at first the administration was not satisfactory, on account of want of supervision over expenses of stores, and sanitation. I therefore appointed an issuer and storekeeper, and a sanitary inspector. To existing accommodation I added a native ward, nurses' quarters, a ward for Colonial contingent, and a boarded marquee for shell wounds, &c.

Both doctors and nurses did excellent work, always short-handed, and frequently under fire. (All the hospital buildings were struck by shells and bullets, and the first convalescent hospital was wrecked, and the second damaged by 94-pounder shells.)

NATIVES.

(Under Mr. Bell, Resident Magistrate and Civil Commissioner.)

Natives in Mafeking, during the siege, were—

Baralongs, 5000; Fingoes, Shangans, and district Baralongs, 2000; Total, between 7000 and 8000.

The Shangans were refugees from the Johannesburg mines, and were sent into Mafeking by the Boers on the outbreak of war. Being accustomed to digging they proved useful for working gangs on the defences.

The district Baralongs, Fingoes, and Cape Boys came into Mafeking when their villages were burnt and their cattle looted by the Boers. From among them we got about 300 men to act as armed cattle guards, watchmen, police, &c.

The local Baralongs living in the Stadt displayed their loyalty, and did some good service (especially after I had deposed their Chief Wessels for want of energy), and supplied good despatch runners, spies, cattle runners, &c.

Of the natives living in the district, Saani remained particularly loyal, and although a prisoner in the hands of the Boers, he managed to send us information from time to time. Bathoen was

loyal, but too timid to be of use. Copane, a subject of the Boers, although forced to supply them with men, offered us his allegiance. Hatsiokomo and Matuba (British subjects), joined the enemy, and the latter and his men fought with them.

RAILWAY.

(Under Captain More.)

132 men, 46 women, 86 children.

Eighteen locomotives, only one of which was damaged by shell fire, as they were moved round to the "lee" side of the railway buildings with every move of the enemy's big gun.

Also a large amount of rolling stock.

Value of railway plant, £120,000.

A defence railway, $1\frac{1}{2}$ mile long, was laid round the north-east front.

We made three armoured trucks, walls of steel rails, iron lookout tower, acetylene searchlight, speaking tubes, electric bells, water, medicine chests, stretchers, &c:

Two hundred tons of rails were used in construction of bomb-proofs.

The armoured trains did much good service.

SPECIALITIES.

Ammunition.—Mr. Fodisch, our gunsmith, reloaded Martini-Henry cartridges, using ordinary gun caps fixed with plaster of Paris for detonators. Powder and bullets were home-made.

Armoured train.—We armoured ordinary long-bogey trucks with steel rails (iron ones not being bullet-proof), to a height of five feet, with loopholes and gun ports. I had three prepared at Mafeking under the able direction of Mr. More, Resident Engineer, Bechuanaland Railway, also three at Bulawayo by Mr. Wallis, Resident Engineer.

Brawn was made from ox and horse hides and feet, and was much appreciated as meat.

Bombs.—Dynamite bombs were made up in small potted-meat and milk tins for use as hand grenades, with slow match fuses, with complete success, by Lieutenant Feltham. Sergeant Page, champion bait thrower of Port Elizabeth, by using a whip stick and short line, was able to throw these with accuracy over a distance of 100 yards.

Fuel.—When coal and wood began to run low, a very satisfactory fuel was made up of coal dust and cow dung mixed.

Fuses.—A simple and useful percussion fuse was invented by Lieutenant Daniell, British South Africa Police, in which the butt end of a Lee-Metford cartridge was used as detonator. This fuse was in regular use with our locally made shells.

Howitzer.—A 6-inch howitzer was made in our workshops, under the orders of Major Panzera, by Mr. Conolly. The bore was a tube of steel, with iron rings shrunk on in two tiers. The breech was a block of cast bronze. The trunnions and ring were a similar solid casting. The gun threw an 18-lb. ball (shell), and reached a distance of 4000 yards.

Lookout poles.—Telescopic lookout poles were made of lengths of iron piping, and set up with steel wire stays, with a pulley and slung seat to hoist the man to the masthead. Height about 18 feet.

Oat bread.—Mr. Ellitson, our master-baker, made up our forage oats into a good form of bread. The oats were winnowed, cleaned, kiln-dried, ground, steam-sieved (twice), and made into bread in the usual way, with a small admixture of Boer meal.

Searchlight.—Mr. Walker, agent for the Acetyline Gas Company, under Captain More's direction, made a very effective and portable acetyline searchlight with an engine head-light and a theodolite stand. These we had stationed in the principal forts and on the armoured train.

Signalling lamp.—Sergeant-Major Moffat and Mr. Walker devised a very effective and portable acetyline signalling lamp, which is reckoned to be readable at 15 miles. We had two in work.

Sowens.—This is a form of porridge, made from the fermented bran of oats after the flour had been extracted for making bread. 100 lb. of bran in 37 gallons of water give 33 gallons of sowens. On this food we fed both natives and whites. We had five sowen kitchens, each capable of producing 800 gallons daily. It was sold at 6d. per quart to those not entitled to it as a ration.

Sausages.—The horses which we used for meat were, as a rule, so poor in condition that we found it best to cut off the flesh from the bones and mince it for issue as ration. The remainder of the carcass then went to the soup kitchen. The mince was then mixed with spice and saltpetre, and made up into sausages, the

intestines of the same animal being used for sausage skins. The meat thus treated lasted longer, and was more palatable.

Steel loopholes.—Finding that the enemy shot through ordinary loopholes at short distances, especially in trench work, I devised a form of steel loophole with two plates of $\frac{1}{2}$ -inch steel bolted together at an angle of 45 degrees, with a hole 2 inches square in the middle of the joint, the shield being 2 feet high and 2 feet wide.

Steel sap roller.—I also had a sapping shield made of two sheets of $\frac{3}{8}$ -inch steel, each 4 feet square, bolted together at an angle and mounted on wheels, to be pushed in front of a party pushing a sap under fire.

RELIEF COMMITTEE.

Numbers of the refugees, and some of the townspeople, being without means during the siege, I formed a relief committee, consisting of the mayor, the base commandant, the chaplain, and other representative men, with myself as president, for disbursing funds for purchase of clothing and necessaries, &c., and for the issue of rations to deserving cases.

Sums received from England, from the various relief funds, were thus carefully and advantageously administered and accounted for, and there was no real suffering among the white population.

STAFF.

Headquarters.—Colonel Commanding, Colonel Baden-Powell; Chief Staff Officer, Major Lord E. Cecil, D.S.O.; Deputy-Assistant Adjutant-General (B), Captain Ryan, Army Service Corps; Aide-de-Camp, Captain G. Wilson, Royal Horse Guards; Intelligence Officer, Lieutenant Hon. A. Hanbury-Tracy, Royal Horse Guards.

Local.—Commanding Artillery and Deputy-Assistant Adjutant-General, Major Panzera, British South Africa Police; Base Commandant and Commanding Engineer, Major C. B. Vyvyan, "Bufs"; Principal Medical Officer, Dr. W. Hayes (at first), Major Anderson, Royal Army Medical Corps; Chief Paymaster, Captain Greener, British South Africa Police; Town Commandant and Protectorate, Natives, Major Goold-Adams, C.B., C.M.G.; Local Natives, Mr. C. G. H. Bell, Resident Magistrate and Civil Commissioner; Women and Children, Mr. F. Whiteley, Mayor; Transport, Lieutenant McKenzie; Post and Telegraphs, Mr.

Howat, Postmaster; Chaplains, Rev. W. H. Weeks (Church of England), Rev. Father Ogle (Roman Catholic).

SPIES.

The enemy were well informed of all that went on in Mafeking during the siege. We had over thirty suspects in the gaol for the greater part of the time, but it was almost impossible to get proofs against them. The stationmaster had undoubtedly been in communication with an ex-Fenian, Whelan, a prominent member of the Irish Land League. This man we arrested on the outbreak of war, and kept in gaol. He had among his papers a code for messages.

The natives acted as spies for the enemy; we caught two and tried them, and shot them.

More than half the families in the women's laager were Dutch, and of pro-Boer sympathies.

Four of our men deserted to the enemy at different times.

TRANSPORT.

(Under Lieutenant McKenzie.)

This department was very ably managed, and, though at first much hired transport was employed, Lieutenant McKenzie gradually arranged so that the whole of the Army Service Corps, Royal Engineers, sanitary, &c., duties (as well as the regimental work) were carried out by the Government transport available, viz.—

11 waggons.	3 ambulances.
6 Scotch carts.	188 mules.
2 trollies.	12 oxen.

The mules kept their condition wonderfully well, considering the absence of forage and the amount of work.

WATER SUPPLY.

(Under Major Vyvyan and Major Hepworth.)

The enemy cut off our water supply from the waterworks during the first few days of the siege. Fortunately the season was unusually wet, and consequently the Molopo stream did not run dry, and house tanks kept fairly filled. But to make sure against

contingencies, and to ensure a supply of wholesome water, we cleaned out various wells, and dug a new one of great capacity.

The water from these was issued to the town and garrison by means of tank waggons, filled nightly, and posted at convenient points during the day.

WOMEN'S LAAGER.

(Under Mr. F. Whiteley, the Mayor.)

Formed at Mr. Rowland's house, where everything was placed at the disposal of the refugees in a most kindly way by Mr. Rowlands.

Number of whites—10 men, 188 women, 315 children; also about 150 native servant girls.

Health fairly good considering the circumstances. Diphtheria made its appearance, but, after four cases, was stopped by isolation. Deaths, 24.

A large bombproof, 180 yards by 5 feet, was made for the accommodation of the whole of the inhabitants of the laager, with protected ways, latrines, &c.

The women and children were rationed, the supply and distribution being efficiently carried out by Mr. Whiteley, without any kind of remuneration to himself.

This gentleman carried out the entire management of the laager with conspicuous success, and was very ably assisted by Rev. W. H. Weekes and Mr. Rowlands.

The following were the cases dealt with by the Court of Summary jurisdiction:—

CHARGES.

Housebreaking, 14.	Minor offences, 184.
Treason, 35.	Theft, 197.
Total, 430.	

PUNISHMENTS.

Death, 5.	Fines, 57.
Corporal punishment, 115.	Imprisonment with hard labour, 91.
Detention in gaol, 23.	Total, 291.
Total fines, £140, 3s. 6d.	

III.—ENGAGEMENTS DURING THE SIEGE.

ACTION OF 14TH OCTOBER.

Six Miles north of Mafeking on railway.

Early in the morning of the 14th October our reconnoitring patrols exchanged shots with a strong party of the enemy, who were advancing along the railway three miles north of the town.

I ordered out the armoured train, under Captain Williams, British South Africa Police, to endeavour to rush the Boers, and pour a heavy fire into them, as I wanted to make the first blow felt by them to be a really hard one. The train carried a 1-pounder Hotchkiss and a .303-inch Maxim, and fifteen men, British South Africa Police.

I sent out, in support of the train, a squadron of the Protectorate Regiment, under Captain FitzClarence.

On coming up with the train he found it heavily engaged with the Boers, who had been strongly reinforced from their laager, some seven miles north; they had also brought up a 7-pounder Krupp and a 1-pounder Maxim.

Captain FitzClarence, dismounting his men, advanced to attack with his left protected by the train.

For a quarter of an hour he was held by the enemy under a very hot fire, and then, pressing forward, well backed up by the train, he drove the enemy back, and successfully beat off their several attempts to encircle his flank. Meantime, I sent up an additional troop under Lord Charles Bentinck, and also a 7-pounder. These also became hotly engaged, and did good work. The fire from the armoured train put the enemy's gun out of action before it had fired a shot, and eventually drove the 1-pounder Maxim from the field.

The engagement lasted about four hours, and the enemy largely outnumbered our men, but Captain FitzClarence made up for this deficiency by the able handling of his men. Moreover, he kept his orders in his mind, and when he saw the opportunity he got his wounded on to the train, and, after driving the enemy back, he withdrew his command quietly on Mafeking covered by the train, without any attempt on the part of the enemy to follow him up.

In this, their first engagement, the Protectorate Regiment

showed a spirit and dash worthy of highly-trained troops, and were most ably led by Captain FitzClarence and Lord C. Bentinck.

This smartly fought little engagement had a great and lasting moral effect on the enemy.

Their losses were afterwards found to amount to fifty-three killed (including four field cornets), and a large number wounded. They also lost a number of horses.

Our casualties were—

- 2 killed.
- 16 wounded (including two officers).
- 1 missing (cyclist).
- 4 horses killed.
- 12 wounded.

ENEMY'S ATTACK ON THE STADT, 25TH OCTOBER 1899.

Enemy commenced shelling at 6.30 A.M. till midday from the east and south with seven guns. At noon they commenced a general advance against the town from the south-west, east, and north-east; the south-west being the main attack directed against the Stadt. Their number about 3000. The enemy commenced firing at extreme range, to which we made no reply, reserving our fire for close distances. So soon as our volleys and Maxims commenced the enemy stopped their advance, and soon began to withdraw at all points. Casualties on our side were, one man wounded, and two horses and eight mules wounded; the Boers' losses unknown, but probably considerable, as their ambulances were on the field picking up for over an hour after the engagement.

It was afterwards (10th December) ascertained that the attack on the Stadt was intended as a feint, while the main attack should come off to northward, on our western face. The Boers had expected the Baralonges not to fire on them, and so advanced more openly than they would otherwise have done; nor had they expected to find white men defending the Stadt. Their loss was, therefore, pretty heavy, and, surprised at their rebuff, they fell back altogether.

At one period of the action, a small mounted troop of Boers advanced at a gallop towards the western position, and came under

fire of the Cape Police Maxim, which dropped five of them ; the remainder rapidly dispersed.

During the afternoon some of our scouts near the Brickfields were moving, under fire, when one of them fell with his horse and lay stunned. Two Cape Police troopers in the works ran out and placed the injured man on his horse, and brought him in under heavy fire from the enemy ; names, Troopers George Collins and W. F. Green.

NIGHT ATTACK ON BOER TRENCHES, 27TH OCTOBER 1899.

During past two days enemy had moved their advanced trenches closer into the east face. I determined to make an attack on their main advanced trench with the bayonet, in order to discourage their advancing further.

A night attack was therefore organised with Captain FitzClarence's squadron, Protectorate Regiment, supported by a party of Cape Police. Guiding lights were hoisted, by which Captain FitzClarence was able to lead his party past the flank of the main trench.

The attacking force moved off 9.30 P.M. in silence, with magazines charged, but no cartridges in the chamber, the order being to use the bayonet only. The men wore white armllets and used " FitzClarence " as their password. The night was dark but still. The squadron attained its position on the left rear of enemy's trench without being challenged or fired at. Captain FitzClarence then wheeled up his men, and with a cheer charged into the main and a subsidiary trench, and cleared both with the bayonet.

The enemy's rearward trenches opened a heavy fire, to which the Cape Police replied from a flank, in order to draw the fire on to themselves, and so to allow Captain FitzClarence's squadron to return unmolested.

The whole operation was carried out exactly in accordance with instructions, and was a complete success ; the more so as the enemy, being taken by surprise, were in much confusion, and, as we afterwards discovered, fired into each other. Their casualties, we heard on reliable authority, amounted to forty killed and wounded with the bayonet, sixty killed and wounded by rifle fire. Our casualties were six killed, nine wounded, two missing.

KILLED.

- 4323 Corporal Burt, 17th Lancers.
 442 Trooper Josiah Soundy, Protectorate Regiment.
 443 Trooper Charles Mayfield Middleditch, Protectorate
 Regiment.
 171 Trooper Thomas Fraser.
 202 Robert Ryves MacDonald.
 222 Alexander Henry Turner.

WOUNDED.

Captain FitzClarence, slightly.
 Lieutenant Swinburne, slightly.
 Corporal Bernard Johnson.
 Corporal Clement Adkins.
 Trooper Arthur Bodill, severely.
 Trooper Charles Donovan.
 Trooper A. H. Hodgkinson.
 Trooper H. A. Dawson.
 Trooper F. W. Hooper.

MISSING.

Trooper Thomas Powell.
 Trooper Franz Aurel.

The missing men were captured by the enemy.

ACTION AT CANNON KOPJE, 31ST OCTOBER 1899.

The enemy opened a heavy, concentrated shell fire from the south-eastern heights, from the racecourse (east), and from Jackal's Tree (south-west), directed against Cannon Kopje. The fire was well aimed, and the racecourse gun took the work in reverse. For a time little harm was done, beyond knocking down parts of the parapet, and smashing the iron supports of the lookout tower; most of the garrison were lying in the trenches some 80 yards in rear of the fort. The gun and two Maxims in the work had been previously dismantled and stowed away for safety during shell fire, to which, of course, they were powerless to reply. The telephone wire was cut away early in the proceedings. After half-an-hour's steady and accurate artillery fire, the enemy, who had been gradually massing on the high ground south and south-

east of the fort, began to advance in line of skirmishers from three sides at once; they were backed up by other parties in support. A large force also collected in the Molopo Valley, south-east of the town, and were formed evidently with the idea of storming the town after Cannon Kopje had been captured.

As the enemy began to get within range of the fort, the garrison moved up from their trench and manned the parapets and Maxims. It was then that we suffered some casualties from shell fire. As the enemy continued their advance, I sent to Captain Goodyear's Colonial Contingent to advance a party on to a ridge above them, and so to take enemy's attacking line in flank, but they could not be got to move.

One Maxim at Ellis's Corner now jammed, and I had to replace it by one from the reserve.

Meantime, I had a 7-pounder run out under cover of houses near south corner of the town. This opened, under direction of Lieutenant Marchison, on the flank of the enemy's line as it began to get near the fort. The gun made excellent practice, every shell going in among them, and effectually stopped the further advance of the Boers.

These now hesitated and began to draw off, and as they did so their guns reopened on Cannon Kopje to cover their retirement. The fire then died down, and the enemy sent out ambulances under Red Cross flags to recover their dead and wounded. We lost six killed and five wounded.

KILLED.

- Captain the Hon. Douglas Marsham.
- Captain Charles A. K. Pechell.
- 2391 Troop Sergeant-Major William Henry Connihan.
- Troop Sergeant-Major Hugh Bagot Upton.
- 2566 Trooper Arthur John Martyn.
- 2517 Frank St. Clair Traill Burroughes.

WOUNDED.

- Quarter-Master-Sergeant E. O. Butler.
- Corporal A. J. Cook.
- Corporal F. C. Newton.
- Trooper C. W. Nicholas.
- Trooper F. R. Lloyd.

(The two latter died the following day.)

During this fight the Boers sent out a Red Cross flag on to a commanding point and then brought their guns up into position there. I visited Cannon Kopje after the fight, and congratulated Colonel Walford and his men on the gallant and determined stand made by them in the face of a very hot shell fire.

The intention of the enemy had been to storm Cannon Kopje, and thence to bombard the south-eastern portion of the town, and to carry it with the large forces they had collected in the Molopo Valley. Their whole scheme was defeated by the gallant resistance made by the garrison, and by the telling fire it brought to bear on them. We afterwards learnt that the attack was designed and directed by young Cronje. The enemy's loss was not known, but ambulances were seen about the field picking up for a considerable time, and native spies reported there was much mourning in the laagers, and that several cart-loads of dead had been brought in and buried.

SURPRISE ON ENEMY'S WESTERN LAAGER, 7TH NOVEMBER 1899.

At 2.30 A.M. Major Godley paraded his force, in accordance with a plan I had arranged, to attack the western camp of the enemy with a heavy fire at daylight, and then to retire again before enemy's guns and reinforcements arrived on the scene. The force in enemy's camp was reckoned at 200 to 250. Our force consisted of—

Two 7-pounders.

One 1-pounder Hotchkiss, under Major Panzera.

One squadron of 60 men, Protectorate Regiment, dismounted, under Captain Vernon.

One troop of 30 men, Bechuanaland Rifles, mounted, under Captain Cowan.

This force moved out along the heights to about 1500 yards in advance of Major Godley's position; Captain Vernon's squadron leading in attack order, with the guns on the left rear, and Bechuanaland Rifles covering his right rear.

At 4.15 A.M., our guns opened on enemy at 1800 yards, and the squadron fired volleys by alternate troops into the enemy's camp, over which they had full command from the heights they were on. The surprise was complete, the enemy bolting in all directions to take cover. Their 1-pounder Maxim and 7-pounder Krupp in the Beacons Fort in a short time responded with a

heavy and well-directed fire. Large bodies of reinforcements very soon began to come down from the main south-west laager. Major Godley thereupon commenced withdrawing his forces, artillery retiring first; the Bechuanaland Rifles occupying Fort Ayr to cover the retirement, which they did very effectively against a wing of mounted Boers who had worked round to our right flank. The enemy brought a very heavy musketry fire to bear on our force, but the retirement was carried out with the greatest steadiness. Enemy's strength about 800 or 1000. Our retirement was further covered by 7-pounder at the west end of the Stadt, and the Cape Police Maxim and escort. In the course of the retirement our 1-pounder Hotchkiss upset and broke the limber-hook; her crew, Gunners R. Cowan and H. Godson, very pluckily stood up and repaired damage with rope, &c., and got the gun away safely under heavy fire from enemy's 1-pounder Maxim and 7-pounder Krupp and rifle fire.

Three of the enemy's ambulances were seen picking up their casualties after the action, and we afterwards learnt that they had lost a considerable number. On our side we had five men wounded, five horses killed, five wounded, and thirty-six cattle in the refugee laager killed and wounded by bullets.

NAMES OF WOUNDED.

Major Godley, slightly.
Trooper Hodgkinson, Protectorate Regiment.
Trooper J. G. Thompson, Protectorate Regiment.
Trooper P. J. Westdyk, Bechuanaland Rifles.
Corporal R. B. Christie, Cape Police.

On this day a commando of the Boers made a demonstration against Khama's men on the Limpopo, and opened fire upon them, but shortly after retired across the border.

ACTION AT GAME TREE, 26TH DECEMBER 1899.

The Boers' work at Game Tree, 2500 yards north of town, had checked our grazing in that direction, and it commanded our line of communication northward. Some shells thrown into it a few days previously had caused enemy temporarily to vacate it, showing it to be a weak open work; this had been confirmed by reconnaissance by our scouts, but as the enemy had been seen strengthening it during the past few days, I determined to attack

before they should make it impregnable. Accordingly, two squadrons Protectorate Regiment, supported by armoured train and Bechuanaland Rifles, were ordered to attack from the left flank of the work, under direction of Major Godley, while three guns and Maxim prepared the way from the right front of the work. This scheme was carried out at dawn on the 26th, the guns making good practice, and the two squadrons advancing in attack formation exactly as required. But on pressing home the attack a heavy fire killed or wounded most of the officers and the leading troops. These succeeded in gaining the parapet, but the work was found to have been strongly roofed in, and so closed as to be impregnable.

The attack fell back upon the eastern face, and pushed forward again on the southern face, but eventually had to retire with a loss of—

Captain Vernon.

Captain Sandford.

Lieutenant Paton, and twenty-one non-commissioned officers and men killed, and

Captain FitzClarence and twenty-two men wounded.

Three missing.

If blame for this reverse falls on any one it should fall on myself, as everybody concerned did their part of the work thoroughly well, and exactly in accordance with the orders I had issued. Both officers and men worked with splendid courage and spirit.

BOERS' ATTACK, 12TH MAY 1900.

At about 4 A.M. on 12th May a very heavy long-range musketry fire was opened on the town from east, north-east, and south-east. I sounded the alarm, and the garrison stood to arms. The fire continued for half-an-hour. I thereupon wired to the south-west outposts to be on the lookout.

At about 4.30, 300 Boers made a rush through the western outposts and got into the Stadt; this they then set fire to. I ordered the western defenders to close in so as to prevent any supports from coming in after the leading body, and sent the reserve squadron there to assist. They succeeded in driving off an attack of about 500 without difficulty, and returned to round up their station. In the meantime, the Boers in the Stadt had

